VOLUME LII NUMBER THREE

THE NATIONAL GEOGRAPHIC MAGAZINE

SEPTEMBER, 1927

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Our Transatlantic Flight
With 18 Illustrations
COMMANDER RICHARD E. BYRD, U. S. N.

PUBLISHED BY THE
NATIONAL GEOGRAPHIC SOCIETY
HUBBARD MEMORIAL HALL
WASHINGTON, D.C.

$3.50 A YEAR 50¢ THE COPY

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ORGANIZED FOR "THE INCREASE AND DIFFUSION OF GEOGRAPHIC KNOWLEDGE"

TO carry out the purposes for which it was founded thirty-nine years ago, the National Geographic Society publishes this Magazine. All receipts are invested in the Magazine itself or expended directly to promote geographic knowledge.

ARTICLES and photographs are desired. For material which the Magazine can use, generous remuneration is made. Contributions should be accompanied by an addressed return envelope and postage.

IMMEDIATELY after the terrific eruption of the world's largest crater, Mt. Katmai, in Alaska, a National Geographic Society expedition was sent to make observations of this remarkable phenomenon. Four expeditions have followed and the extraordinary scientific data resulting given to the world. In this vicinity an eighth wonder of the world was discovered and explored—"The Valley of Ten Thousand Smokes," a vast area of steaming, spouting fissures. As a result of The Society's discoveries this area has been created a National Monument by proclamation of the President of the United States.

AT an expense of over $50,000 The Society sent a notable series of expeditions into Peru to investigate the traces of the Inca race. Their discoveries form a large share of our knowledge of a civilization waning when Pizarro first set foot in Peru.

THE Society also had the honor of subscribing a substantial sum to the expedition of Admiral Peary, who discovered the North Pole.

NOT long ago The Society granted $25,000, and in addition $75,000 was given by individual members to the Government when the congressional appropriation for the purpose was insufficient, and the finest of the giant sequoia trees of California were thereby saved for the American people.

THE Society is conducting extensive explorations and excavations in northwestern New Mexico, which was one of the most densely populated areas in North America before Columbus came, a region where prehistoric peoples lived in vast communal dwellings and whose customs, ceremonies, and name have been engulfed in an oblivion.

TO further the important study of solar radiation in relation to long-range weather forecastings, The Society has appropriated $60,000 to enable the Smithsonian Institution to establish a station for four years on Mt. Brukkaros, in Southwest Africa.

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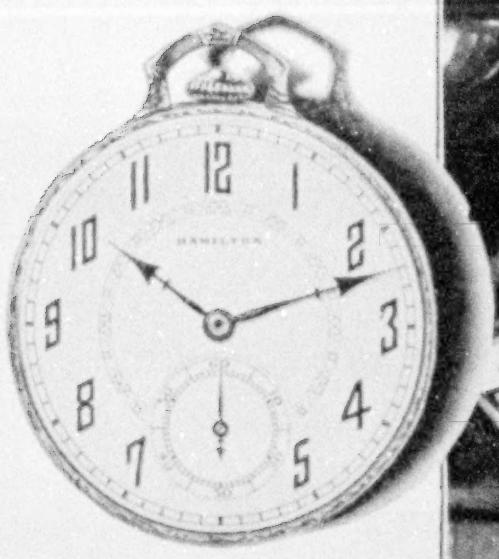


The Cleveland model . . . *A smart new design with rigid bow, fashioned of filled green or white gold, exquisitely chased. 17-jewel movement.* $50

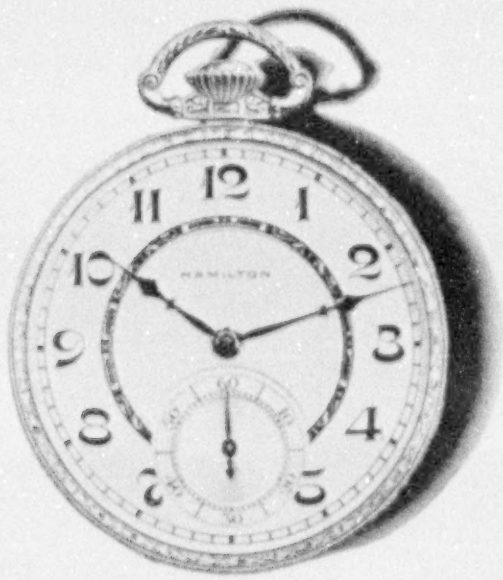
for Fifty Dollars

you can have your choice of several beautiful Hamilton Timekeepers

JEWELERS tell us that many people think of the Hamilton as very high-priced. These examples of Hamiltons at Fifty Dollars are presented as our answer. The Hamilton's long record for great accuracy probably creates the impression of extra-high price. Only for considerable money, people suppose, could such an accurate watch be made.

The Hamilton is offered in many models; and, in platinum cases, is sold as high as $685. We assure you that every Hamilton is a true Hamilton. We have but one standard for each Hamilton no matter what its price. The models shown on this page are presented in beautiful cases. Your jeweler will show you these and other Hamiltons at $50.

For full information and descriptions of all Hamilton models, send your name and address for copies of "The Timekeeper" and "The Care of Your Watch." Hamilton Watch Company, 882 Columbia Avenue, Lancaster, Pa., U. S. A.

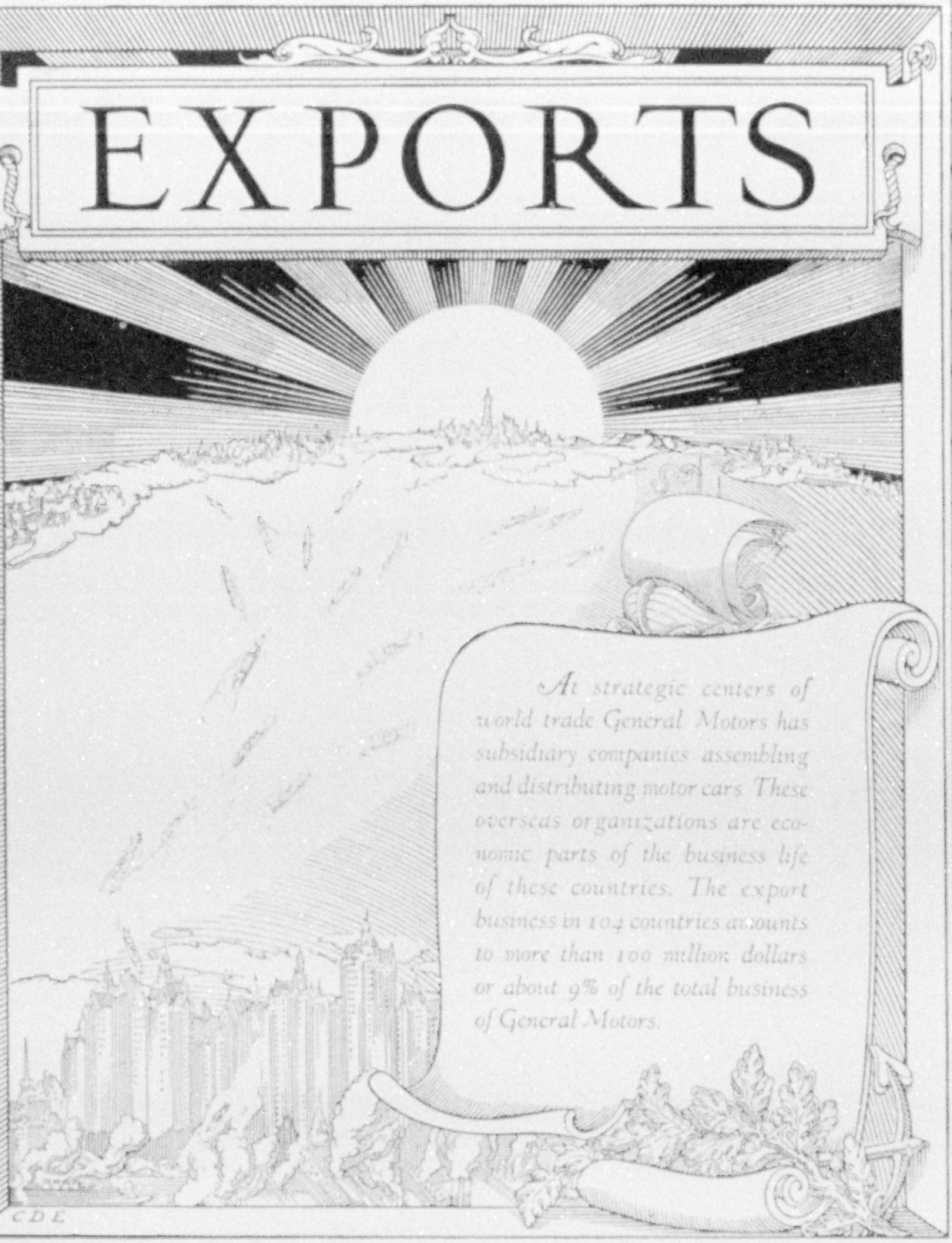


The Buchanan model . . . *Fashioned of green or white filled gold, chased in a beautiful design. Fitted with Hamilton 17-jewel movement.* $50

Hamilton Watch

The Watch of Railroad Accuracy

EXPORTS



At strategic centers of world trade General Motors has subsidiary companies assembling and distributing motor cars. These overseas organizations are economic parts of the business life of these countries. The export business in 104 countries amounts to more than 100 million dollars or about 9% of the total business of General Motors.

CDE

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LASALLE · CADILLAC · GMC TRUCKS · YELLOW CABS AND COACHES

FRIGIDAIRE—The Electric Refrigerator

Before winter comes — *get the facts on oil heat!*

When you know its benefits you will not want to go through another winter without it.

THE best way to determine the many advantages of oil heat is to talk with friends and neighbors in your community.

Observe for yourself how an oil heater operates and why it enables the home owner to write heating troubles off his calendar forever.

You will find your neighbors proud of their oil heating system. They will be glad to show it to you and to tell you of their experience.

Besides visiting an oil heated home, you will find it helpful to read the Oil Heating Institute's book entitled, "Oil Heating—The Modern Miracle of Comfort."

It gives instructions on how to select an oil heater, and contains specifications of the equipment of leading manufacturers.

Why permit valuable space in your home to be used any longer as a clearing-house for coal and ashes?

With the facts at your disposal you may decide to join the thousands of other progressive home owners who are planning *now* to enjoy oil heat this winter.

OIL HEATING INSTITUTE
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This book is free

MAIL THE COUPON TODAY!

This 80-page book, written by national authorities on oil heating, and published by the Oil Heating Institute, was formerly distributed at ten cents a copy to cover mailing costs. It is now free, if you request it on the coupon.

OIL HEATING INSTITUTE
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This is the Emblem of the *Oil Heating Institute*

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Only the manufacturers who are members of the Oil Heating Institute are permitted to use it.

These manufacturers have earned their membership through the enthusiasm of thousands of home owners whom they have provided with efficient and dependable oil heating.

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The Oil Heating Institute is prepared to furnish special information on the heating of churches, theatres, hotels, apartment houses and office buildings, and on the various heat treating processes of industry.

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350 Madison Avenue, N. Y. C.

Please send me, free of charge, your book entitled "Oil Heating—The Modern Miracle of Comfort" containing instructions on how to select oil heating equipment.

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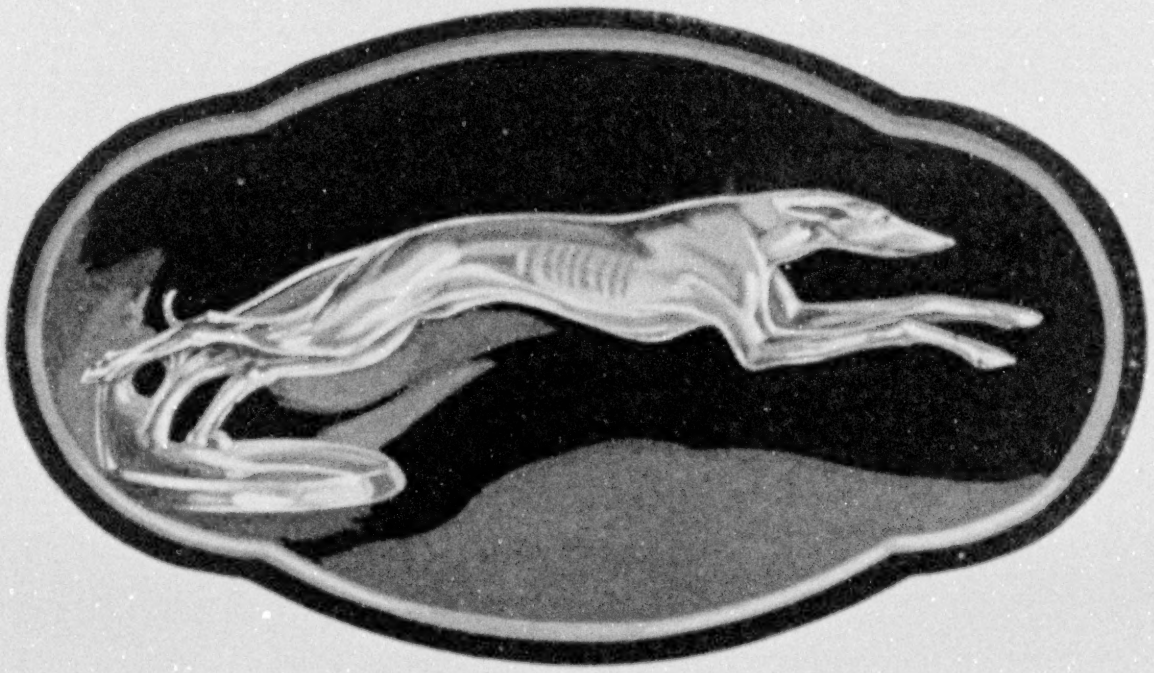
LINCOLN

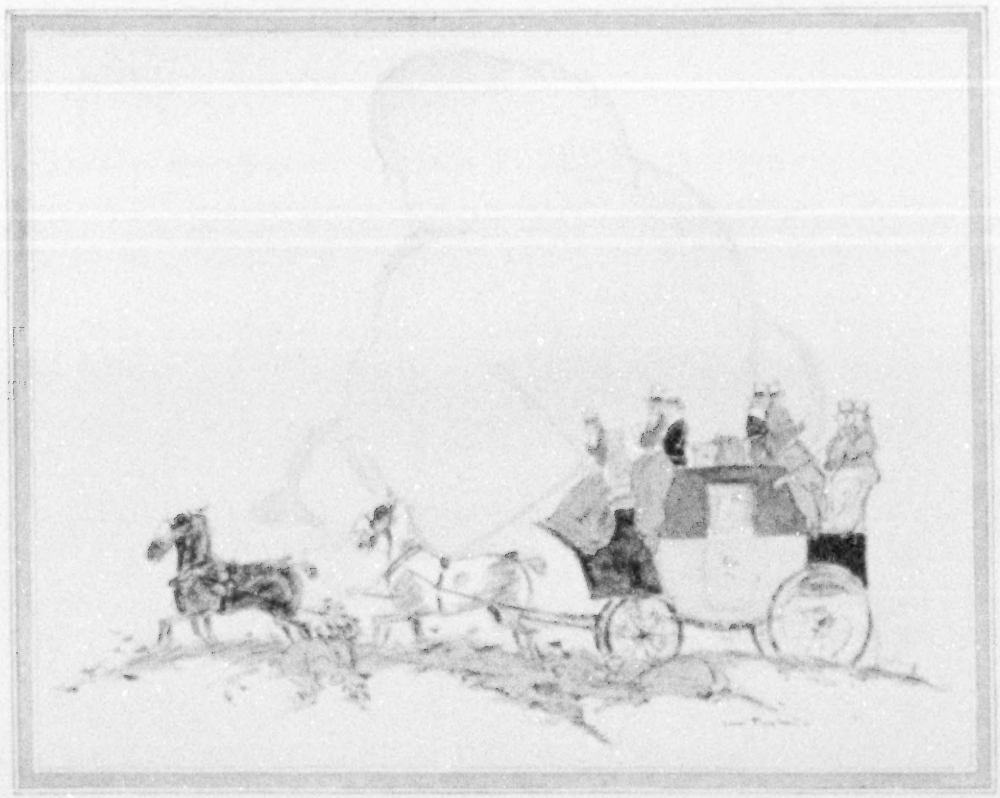


The Greyhound—noted the world over, for swiftness and stamina, for grace and beauty in action—has been selected as the emblem of Lincoln cars. Its poised, silvery body, extended at full speed, graces the radiator cap of every new Lincoln. ¶Long, lithe and sinewy—fleetest of its kind—the Greyhound best typifies Lincoln speed and grace, beauty and endurance.

LINCOLN MOTOR COMPANY

Division of Ford Motor Company

Lincoln cars range in price from $4600 to $7300
completely equipped, at Detroit



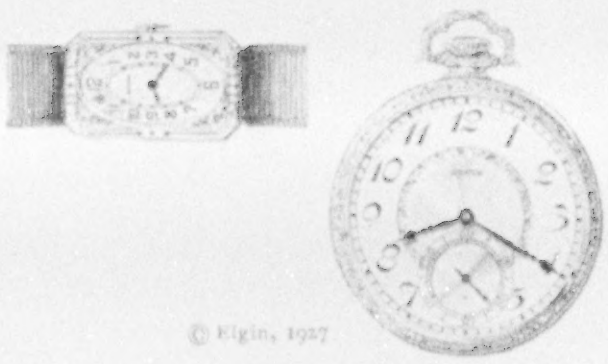
DOES YOUR WATCH BRING BACK GAY TALLYHOS FROM DREAM ROADS FAR AWAY?

A watch may never lose a second yet be many years slow

The bond between a man and such a watch is a secret tie, unknown to a critical and unsympathetic world. So the watch, no matter how highly it may be privily prized, is often publicly condemned as old-fashioned and out-of-style . . . A man, in fact, is judged by the watch he carries, and if that watch be a modern Elgin, the appraisal is ever flattering. For the Elgin is true alike to the time-minute and the style-minute . . . accurate and dependable, unbelievably thin, handsomely encased, a criterion of good taste.

THE WATCH WORD FOR ELEGANCE AND EFFICIENCY

ELGIN



THE WOMAN'S WRIST WATCH, in a case of 18-karat solid white gold, is priced at . . . $85

THE MAN'S WATCH may be had in a 10-karat gold-filled case of white or green tone, seven jewel movement. Sells for $20

(Prices slightly higher in Canada)

Your jeweler will show these and other Elgins to you gladly. No other watch is offered in so generous an assortment of styles nor at a price range so liberal—$20 to $1,750

© Elgin, 1927

MILEAGE RECORDS CRUMBLE

Get the *Thrill* of Dayton Stabilized Balloon Tire Satisfaction

~EQUIP NOW!

THE Dayton Rubber Manufacturing Company has contributed another notable advance in tire construction—the revolutionary *Stabilized* Balloon. It is a tire of surpassing excellence—a tire that will give everything you ask for . . . *and more.*

Stabilized construction absorbs road shocks and distributes wear evenly. Flat, center-traction tread. No singing, no rumbling. Quick-grip, quick-release, non-skid gives lightning "get-away" and perfect safety at all speeds.

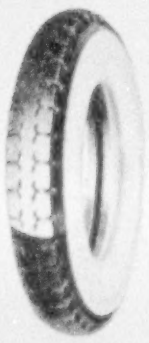
Stabilizing bands of friction rubber draw the center of tread parallel to center of rim, thus preventing "shimmying." The rubber is especially compounded and tempered—by an *exclusive* Dayton process. It is strong and durable—and will outlast extra thousands of miles of toughest driving.

The Dayton *Stabilized* Balloon has many other unparalleled advantages you should know about—exclusive features that will mean more miles and happier miles to you. Ask the Dayton dealer near you about them. Buy no tires until you do.

THE DAYTON RUBBER MFG. CO.
Dayton, Ohio

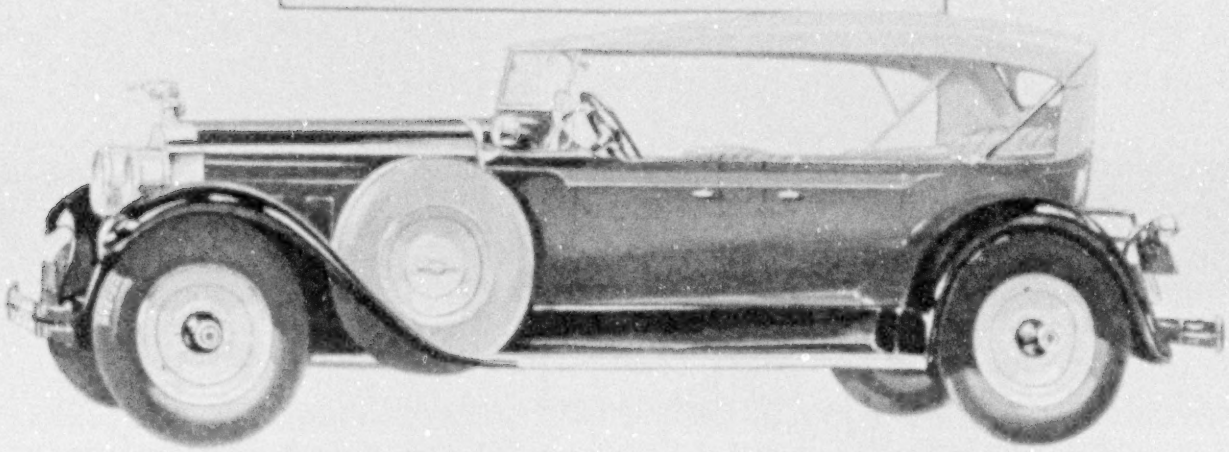
Dayton* STABILIZED BALLOONS

ON WHEELS OF LARGE DIAMETER—install Dayton Thorobred Cords—superlative tire values that smash all mileage records. The Dayton Thorobred is *the pioneer low air pressure tire*—the first to combine comfort with safety and endurance.



Dayton Thorobred Extra-heavy Tubes. Grey—of finest rubber. Red—of purest antimony. Steam-welded and reinforced at valve base. They will hold air.

A thousand years before the Christian era the Chinese had developed the art of fine lacquer work. Notable examples of their craftsmanship were produced in the reign of K'ang-hi (A.D. 1662-1722)



TO CREATE a Packard requires more than money, more than factory facilities, more even than engineering genius and marvelous precision in manufacture. It requires artistic talent of a high order in many fields.

The Packard you see gleaming at your door today is a high achievement in hundreds of different arts and crafts each centuries old, but reaching their supreme development in the modern Packard factory.

The very finish and color of today's PACKARD Packard reflect the results of ages of technical experiment as well as the care and expert judgment of Packard artists and craftsmen. The rare, old lacquered cabinets of the Orient were no more perfect specimens of the finisher's art.

The beauty of Packard design is now enhanced by the charm and brilliancy of the color combinations available—all in perfect taste and all long preserved by the unusual processes which protect the artistry of Packard finish through the years.

ASK THE MAN WHO OWNS ONE

SWANNANOA CLUB
NEAR AFTON, VIRGINIA
Noland & Baskerville, Architects

A Pearl

on green velvet

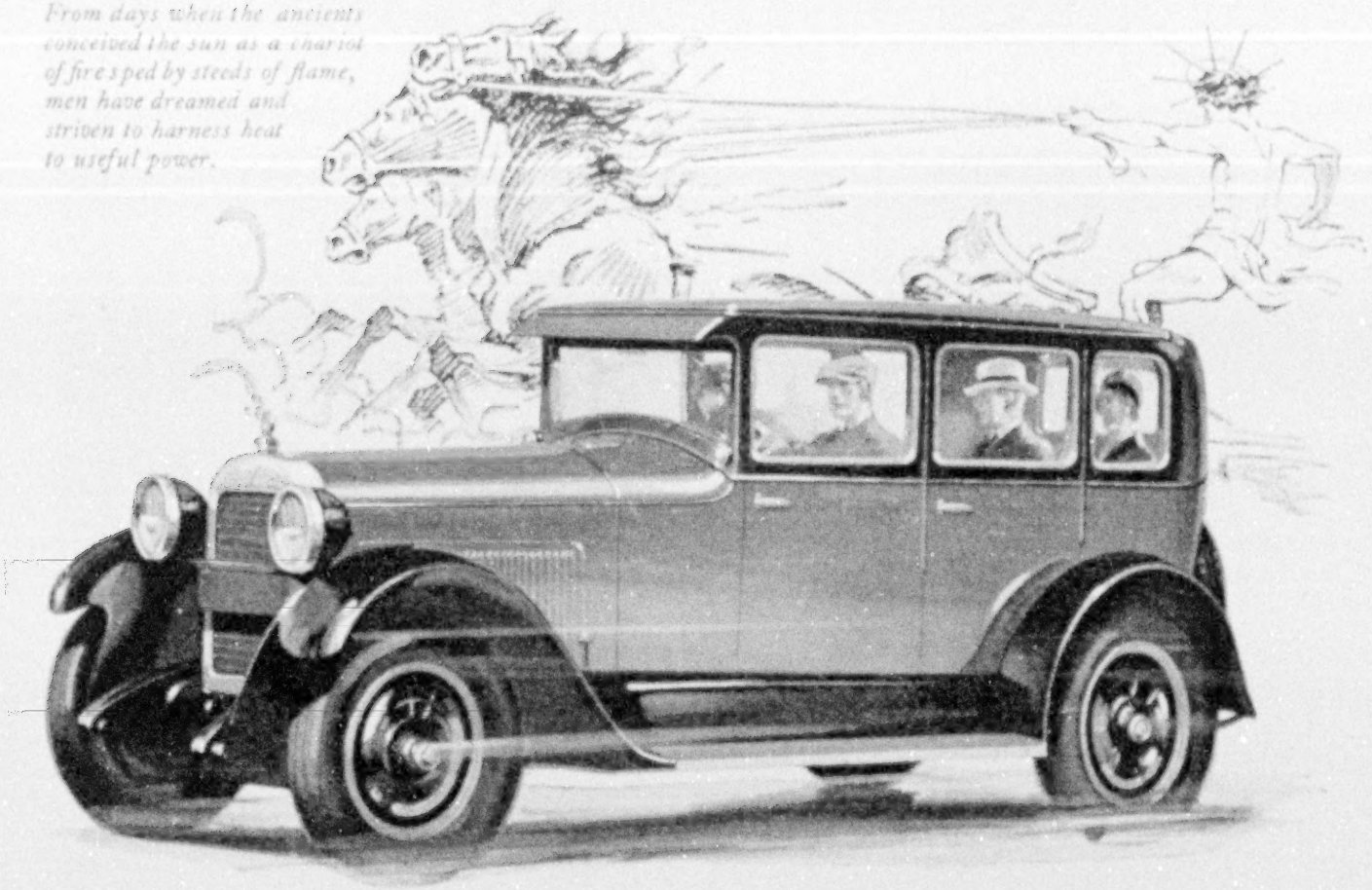
A poet has said that architecture is best described as "frozen music." Its harmony wrought in clear Georgia Marble, the palatial Swannanoa Club is truly a symphony-in-white.

Beauty is an elusive and perishable thing, but in Georgia Marble it has been caught into a permanence and strength that is unsurpassed by any other building material.

GEORGIA·MARBLE

The Georgia Marble Co. Tate, Ga.

From days when the ancients conceived the sun as a chariot of fire sped by steeds of flame, men have dreamed and striven to harness heat to useful power.



A Great Companion Invention to the Super-Six Principle -

Turns waste heat to power

This new companion invention to the Super-Six Principle converts heat wasted in all other types, into useful power.

Together they combine the highest efficiency in power generation, and the maximum efficiency in power transmission ever achieved within our knowledge. It makes Hudson the most economical car per pound weight in the world.

Steam Engine Smoothness and Power

The new Hudson motor delivers a flood of rugged power from standing start closely resembling the mighty and elastic power of the steam engine. It eliminates spark knock. It prevents oil dilution. Ordinary gasoline gives the results sought through special high-priced fuels.

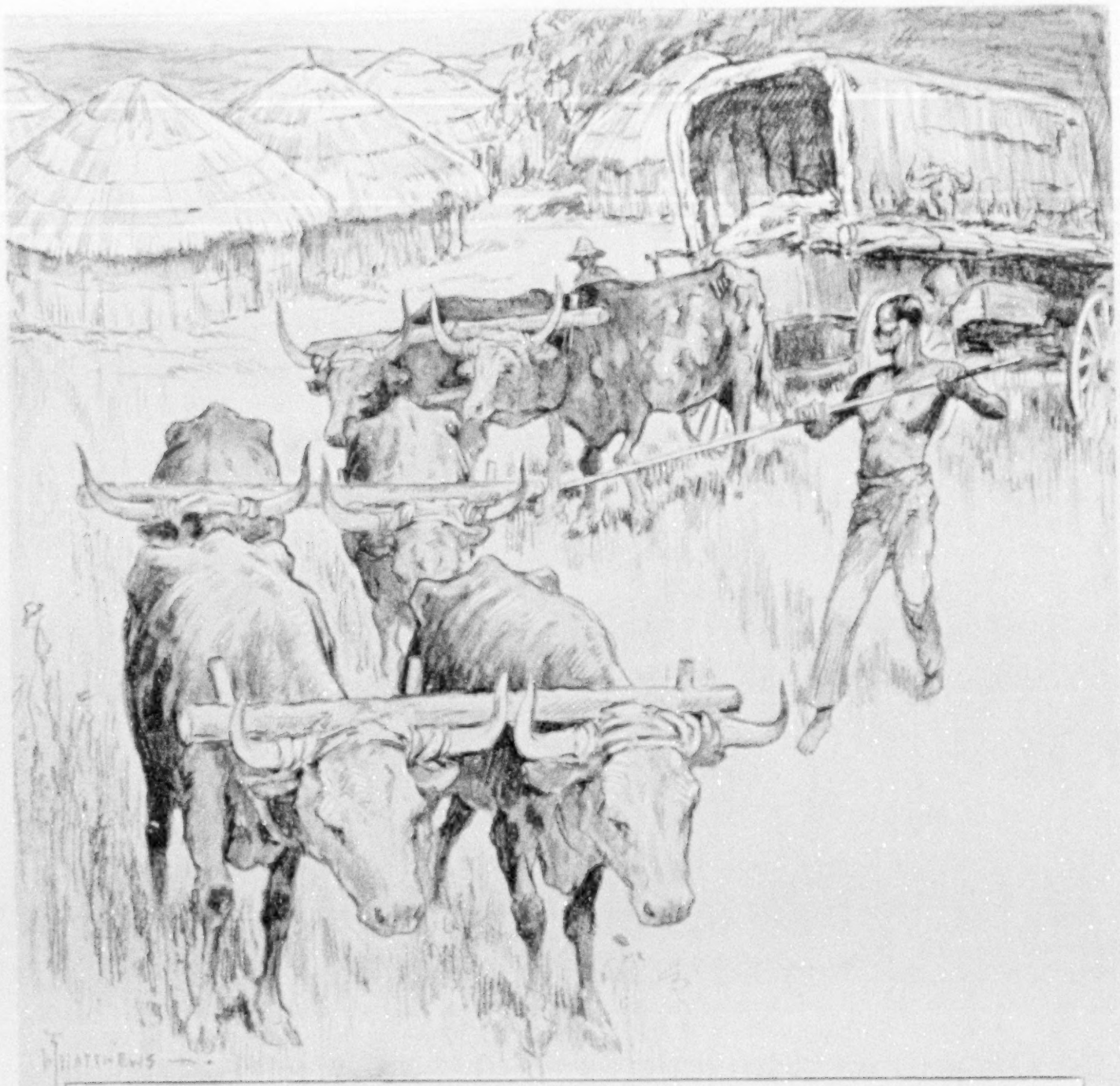
And at all speeds this power is buoyant, vivacious and instantly answerable to the slightest throttle touch.

HUDSON *Super-Six*

STANDARD COACH $1285 STANDARD SEDAN $1385

F. O. B. Detroit, plus war excise tax

Custom Built Models 7-PASSENGER PHAETON BROUGHAM 7-PASSENGER SEDAN



Light on Darkest Africa

What was once "Darkest Africa" is now luminous with life, color and the enterprises of civilization. It is to the great Continent of Africa that thought and adventure are rapidly turning for pioneering, industrial and scientific enterprise.

Durban, Berea, Valley of a Thousand Hills, Umkomaas, Johannesburg, Pretoria, Bulawayo, Victoria Falls; Kimberley, Cape Town, Port Elizabeth and many other places of interest are included in the

World Cruise Supreme

by the specially-chartered Cunard Cruising Ship FRANCONIA. Sailing from New York January 7—Returning May 31, 1928. Two Cruises in One, covering the Northern and Southern Hemispheres. 34,000 miles by sea—10,000 miles by land!

Send for Map and Illustrated Story of this unique Cruise

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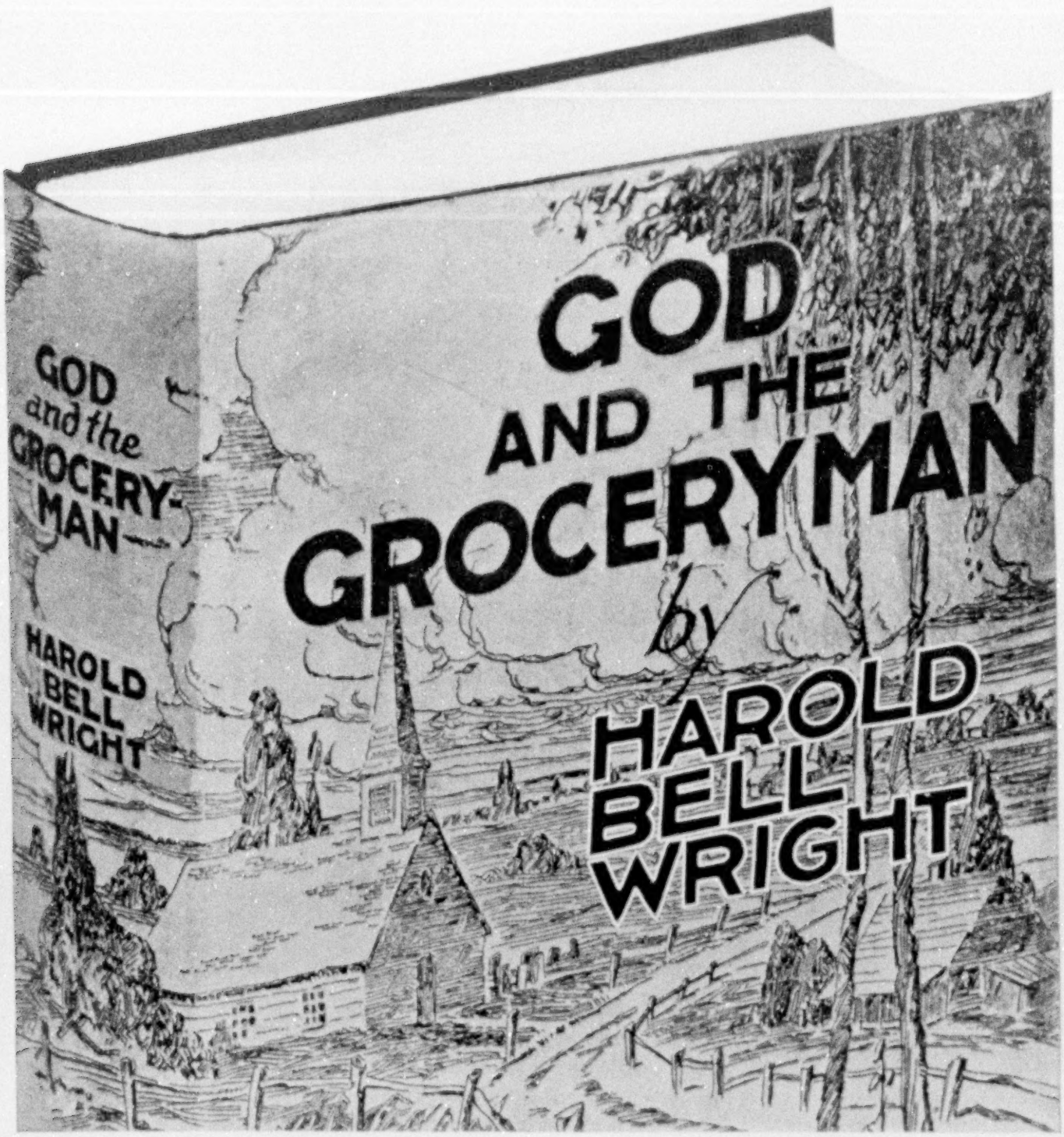

The New Novel by the Most Popular Author in the World

DAN MATTHEWS has come back. The lovable hero of Harold Bell Wright's two novels, "The Shepherd of the Hills" and "The Calling of Dan Matthews," who won the affection and admiration of millions of readers, reappears in a powerful new story of the present day. With his amazing understanding of human hearts and his deep and penetrating knowledge of what is going on in our homes and communities, Harold Bell Wright takes up the subject of bringing real religion to the men and women of America. An inspiring story filled with interesting characters and dramatic situations, a book certain to be discussed everywhere this season. Get your copy of "God and the Groceryman" today at any bookseller's; price, $2.00. This is an Appleton Book.

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The Man *everybody should know*

The importance of scientific dentistry is becoming more and more evident. And the dentist now plays a leading role in alleviating and preventing serious diseases that were for years of obscure origin. So go to your dentist at least twice a year.

IN the constant war on health no enemy is more ruthless than Pyorrhea. Its poison sweeps through the system, ravaging health, often causing such serious troubles as rheumatism, neuritis and nervousness, stomach disorders and anemia.

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The heavy toll demanded by this common enemy is the price of neglect. Four out of five after forty and thousands younger, innocent victims of carelessness, surrender priceless health to Pyorrhea.

Be the Lucky 1 in 5

Don't wait for warning signs, for gums to bleed, for teeth to loosen. Take these two simple precautionary measures to protect your good health: Go to your dentist at least once every six months; have him examine teeth and gums, thoroughly Start using Forhan's for the Gums, today. This scientific dentifrice, the formula of R. J. Forhan, D. D. S., for many years a Pyorrhea specialist, is designed to combat Pyorrhea and to keep teeth and gums free from infection.

Use Forhan's regularly, morning and night, and you are safe. It helps to thwart Pyorrhea or to check its course. It firms gums and keeps them healthy. It keeps teeth white and protects them against acids which cause decay.

If you value good health at its true worth take care of teeth and gums. See your dentist, often. Use Forhan's for the Gums, regularly. Teach your children this practice of prevention. Unlike ordinary tooth pastes, Forhan's is health insurance. It contains Forhan's Pyorrhea Liquid used by dentists in the treatment of Pyorrhetic conditions. Get a tube of Forhan's today. All druggists—35c and 60c.

Formula of R. J. Forhan, D. D. S.

Forhan Company, New York

Forhan's *for the gums*

CHANDLER

for 1928 now adds to its magnificence in new models

New beauty and New features
New lower prices

STEPPING forward in the panoply of great corporate strength, independence and stability, Chandler now brings to the forefront a brilliant array of 1928 models—new cars of spirited design—bodies swung smartly close to the ground—ultra-distinctive, but not extreme—styled to be stylish not just for a year, but for years to come . . .

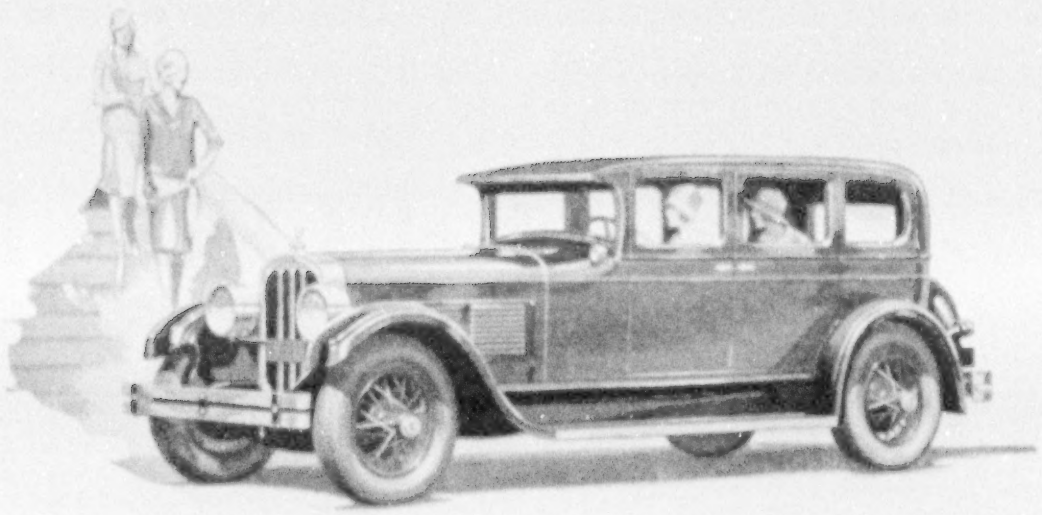
New cars with oceans of satin-smooth power—with a getaway like a jack-rabbit—able to climb serenely up steep hills in high-gear—and able to maintain express-train speed clear across the continent and back . . .

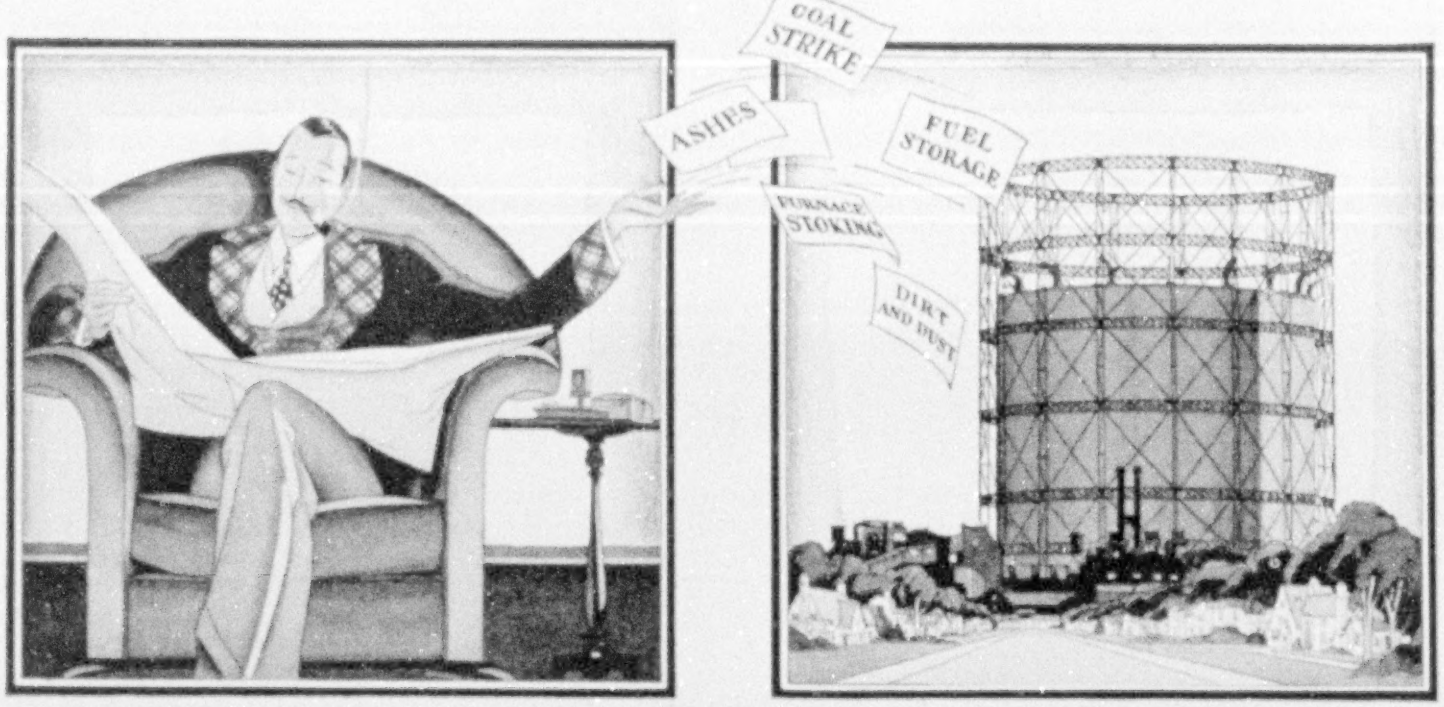
New cars with steering made easier than ever—with springs that really absorb the jolts—with every mechanical requisite for long life—with a chassis that lubricates itself automatically and instantaneously when you push a plunger with your foot . . .

New cars with a large variety of magnificent models—with a wide choice of color harmonies—with an extensive range of new lower prices. New Special Sixes at $945 to $1235; new Big Sixes at $1495 to $1795; new Royal Eights at $1995 to $2195; all prices f. o. b. Factory.

We soberly believe these to be the most valueful motor cars now before the American public—and we ask you to go as far as you like in making comparisons.

CHANDLER-CLEVELAND MOTORS CORPORATION, CLEVELAND





Toss heating worries to the GAS company!

Heat your house with GAS

MANY fortunate people have literally forgotten what heating worries are! Fuel supply, ashes, soot, smoke, noise, bother—all are just a memory. For these people heat their homes with GAS!

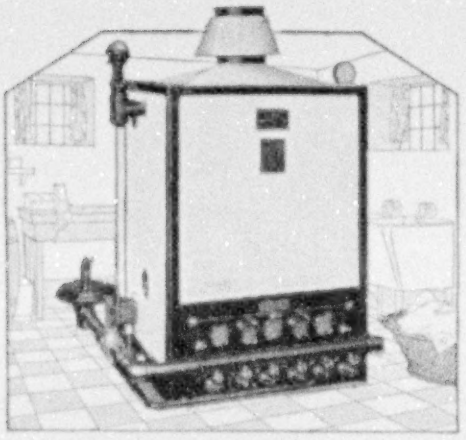
They let their *gas* company install an Ideal Gas Boiler, service it, supply fuel by pipe-line when and as needed, and thus do a completely automatic heating job free from work or worry.

Why GAS heating?

A *gas* boiler means absolutely *clean* heat. No smoke, film, grime, or dust. Less housecleaning. No damage to furnishings and draperies.

It eliminates buying and storing fuel. You pay for heat *after* you've used the fuel. You have two or three times as much space in your basement, and it is *clean* space, fit for anything from laundering to billiards.

And, of course, a gas boiler does away with stoking, ash-hauling and all the bother of running a furnace. There is no noise to the operation of an Ideal Gas Boiler. A few feet away from this really attractive heating plant you'd never imagine it was cozily warming the whole house.



With an Ideal Gas Boiler in your basement you have clean, extra space to use.

Built especially for gas

THE Ideal Gas Boiler is designed by the American Radiator Co., specially to burn gas. It is economical and efficient. It supplies steam or hot water for a radiator system just like any other boiler. But *you* know the vast difference, for when you have it in your basement you've tossed every heating worry to the gas company!

Your gas company will study your individual heating requirements, and shoulder your heating worries!

Get full information in time to act

Now is the time to inquire fully into the advantages of GAS heating. Don't wait for cold weather. Don't go on being a slave to a furnace any longer.

Ask your gas company or heating contractor about Ideal Gas Boilers, or send us coupon below for interesting booklet, which gives full information on gas heating.

IDEAL GAS BOILERS

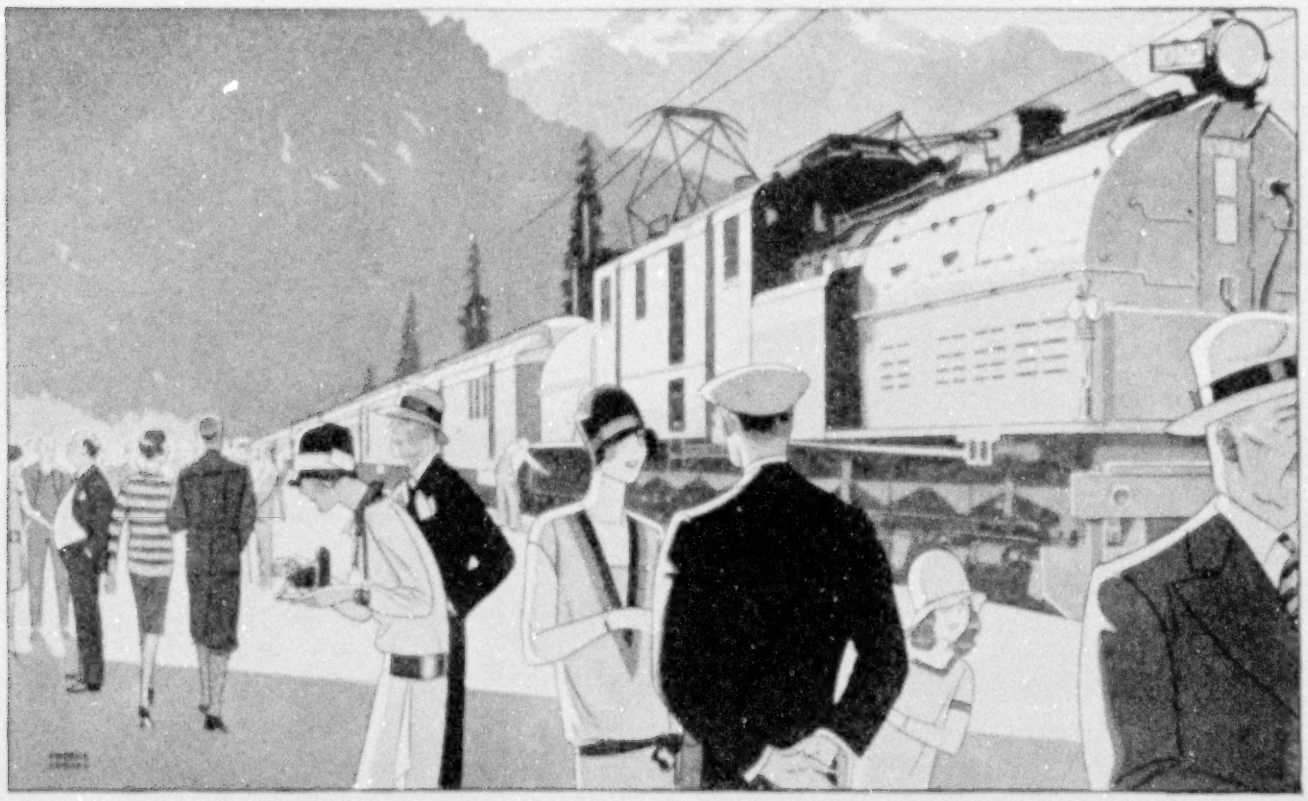
Product of AMERICAN RADIATOR COMPANY

AMERICAN GAS PRODUCTS CORPORATION, *Distributor*

COUPON *to* American Gas Products Corp., Dept. N-1
376 Lafayette St., New York City

Please send me more complete information about GAS house heating. (Name and address in margin below.)

The *New* OLYMPIAN
finest train to the Pacific Northwest!



The MILWAUKEE ROAD

THE *New Olympian* introduces a fresh epoch in rail transportation. Nothing compares to this modern train—new in invention, finest in equipment from wheels to ventilators. It has established *hotel comfort and service* in railroad travel.

No longer need you think of transcontinental journeying only in terms of transportation. The *New Olympian* is a delight in itself. Modern in equipment and character, it is comparable only to famous hotels and luxurious ocean liners. It glides at racing speed on *roller bearings* with a motion so smooth it seems to flow along the rails.

The *New Olympian* is literally the finest thing on wheels. Every last detail is new in the most modern sense. Club-like lounge for both men and women. New-type observation-library-car, charmingly appointed. Exquisite drawing-rooms and compartments. Interiors decorated with fine taste in tones of umber, blue and gold. Dining-cars like intimate corners of fashionable cafes. Staterooms like those of a private yacht.

New electrical conveniences are used for the entire trip. Electric food mixers, beautiful and original designs in electric lighting, electric ventilation providing one thousand cubic feet of pure fresh air per hour to every passenger.

The route is the shortest to the Pacific, electrified for 660 miles—nearly one-third of the journey from Chicago to Seattle-Tacoma.

TO PUGET SOUND
THE CHICAGO MILWAUKEE AND ST. PAUL RAILWAY
ELECTRIFIED

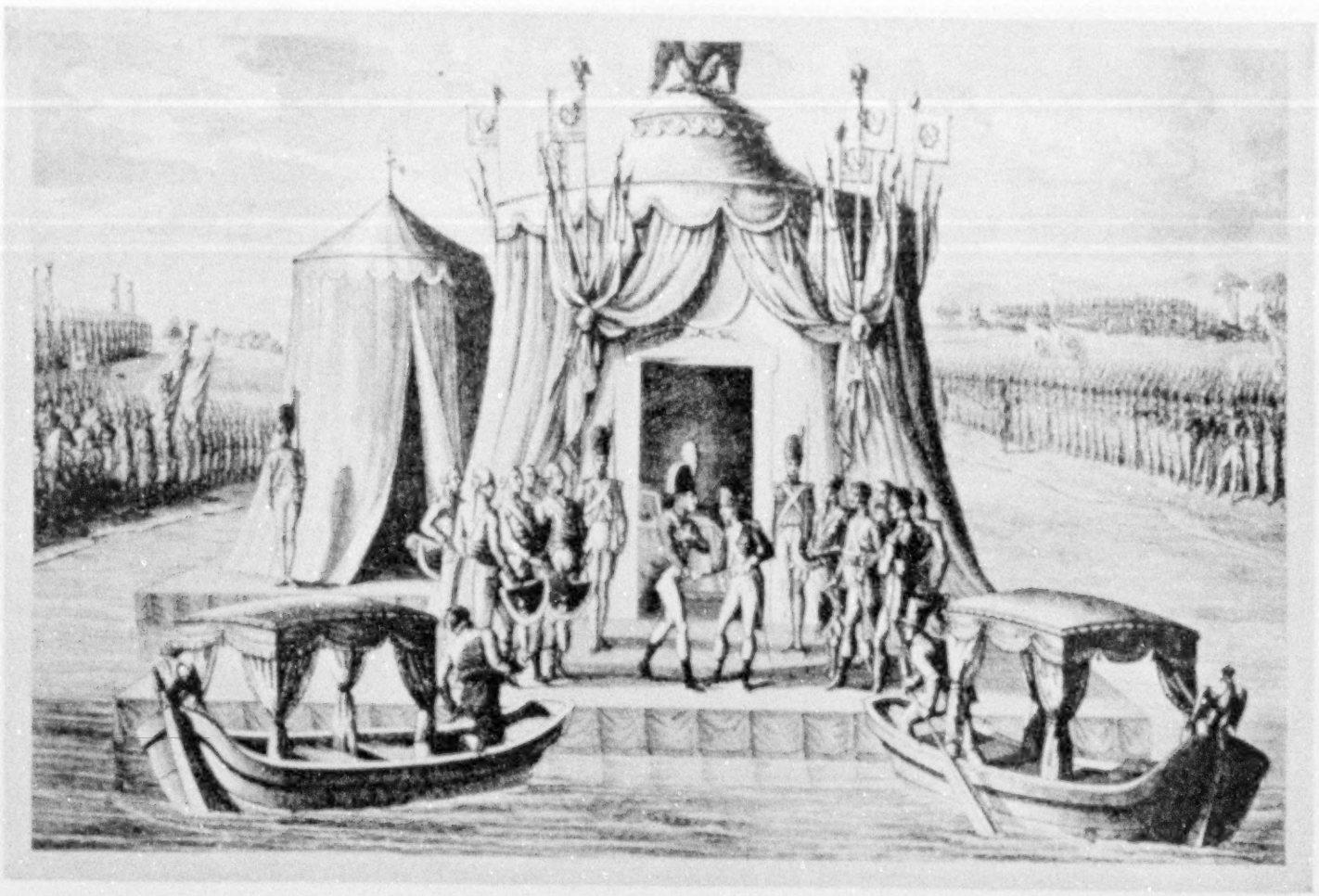
GEO. B. HAYNES, Passenger Traffic Mgr.
Chicago, Milwaukee & St. Paul Railway
Union Station, Chicago, Illinois

I am planning a trip ☐ to Yellowstone Park ☐ to the Pacific Northwest. Please send me your travel literature.

Name _____

Address _____

37



Where two men remade the map of Europe

An atlas is as much a necessity in home or office as a dictionary. Rand McNally Atlases range in price and scope from the little thirty-five cent General Atlas to the $8.50 International Atlas. Each is a handy reference book of geographical information, with valuable indices and accurate maps. Obtainable at leading booksellers' and stationers'. Write for descriptive booklet.

Rand McNally Atlases
for every purpose

International Atlas	Pocket Atlas
General Atlas	Bible Atlas
Premier Atlas	Mileage Atlas
Handy Atlas	Goode School Atlas

Commercial Atlas of America
Commercial Atlas of Foreign Countries

ON June 25, 1807, Napoleon and Alexander I of Russia met on a raft in the River Niemen and divided up several portions of Europe between them.

Though the changes they agreed on proved not to be permanent, every map of Europe made since that date in some measure bears witness to this event.

Even the Great War did not quite obliterate its influence. For the Treaty of Versailles, in making Danzig a free city once again, found its precedent here.

It is thus that the map of any continent becomes at once the summary and monument of its past.

Hardly a border line exists on any representation of Europe that is not suggestive of just some such incident as the famous meeting pictured in the old print reproduced above.

Hardly a place name that does not call to mind some fascinating chapter from history, literature or travel.

An evening with an atlas is a cruise by lamp light to distant lands, a review of history, a pageant of heroes and heroic deeds.

What book more entertaining, more profitable to read? What book constitutes so inexhaustible a source of intellectual recreation?

You can take up an atlas over and over again and each time follow a different course through its pages.

Either an atlas or a globe should hold an important place in every private library.

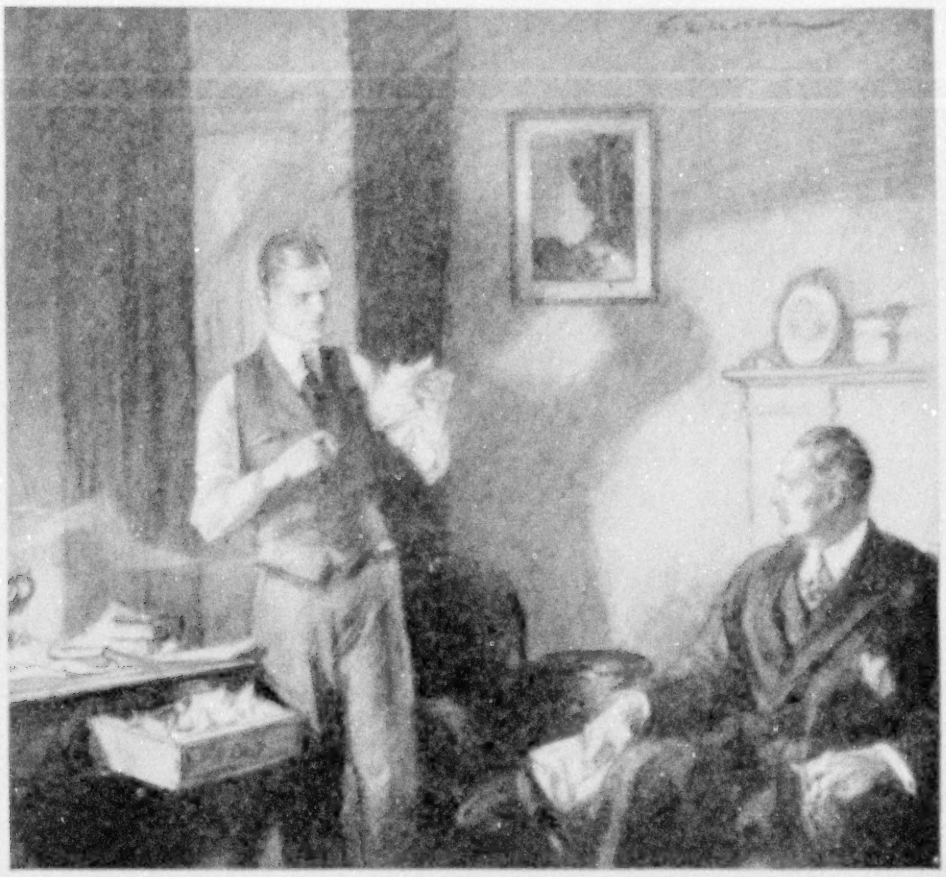
Rand McNally Maps, Globes, and Atlases are always scientific, accurate, up to date. Obtainable at leading booksellers' and stationers' or direct.

The habit of scrupulous accuracy down to the last detail required in the making of maps extends to all Rand McNally & Company's greatly varied activities.

RAND McNALLY & COMPANY
Map Headquarters
Dept. B-9
536 *S. Clark Street*, Chicago 270 *Madison Avenue*, New York
Washington San Francisco Los Angeles

SO FEW MEN CAN DECIDE!

Can you?



THIS happened only a few weeks ago.

A man who had been promoted to a new position, with much larger income, sat talking with a friend. "It's funny what little things influence our lives," he remarked. "Three years ago I was reading a magazine and clipped a coupon from an advertisement —something I almost never do. The coupon put me in touch with the Alexander Hamilton Institute, which laid out a definite course in business reading for me.

"The first time the president of our company ever indicated that he was conscious of my existence was about a month later when I ran across something in my reading that happened to be of very immediate interest to him. From that moment he began to look on me as something more than just a name on the pay roll. You know what's happened since."

The other man sat quiet a moment. Then he rose and, walking over to the table, pulled out the drawer and produced a wrinkled bit of paper.

"I clipped one of those coupons once," he said, "but I didn't do anything more about it. Here it is" . . . he held it out . . . "more than four years old."

That little incident reveals one of the fundamental reasons why some men go forward and others do not. Up to a certain point all men are interested in their business future. They will read about success and talk about it; but at that point they divide sharply into two classes. One group merely talks; the other acts.

Think of the four years that have passed since that man clipped that coupon. In that time, Charles E. Murnan, who was a clerk in a retail store, became vice-president of the great United Drug Company. He says: "I would recommend the Course to anybody, if he had to borrow the money to take it."

In that time, J. A. Zehntbauer, who was a wholesale dry goods salesman, became president of the Jantzen Knitting Mills of Portland, Oregon. He says: "50% of my success could be attributed to my contact with the Alexander Hamilton Institute."

And all this while the man who was interested, but lacked the power of decision, has gone along with petty salary increases, when he might have made a direct short cut to executive opportunity and increased earning power. Some day he will arrive, but he has sacrificed the joy of succeeding while he is still young.

This is not an advertisement in the ordinary sense. It is a business editorial. Two men will read it. One will say, "That is interesting." He may even go so far as to clip the coupon, but it will never be mailed. At the critical moment of decision he will be tried and found wanting.

The other man will say: "This thing involves no obligation or cost. The Course has helped more than 300,000 men to shorten their path to the top. I have a duty to myself and my family to investigate it." He will clip the coupon and *it will be mailed.*

You have decision. Will you let us lay before you a definite plan of business reading, worked out by men who have made an unusual business success? Give one evening to it; decide, alone in your own home, without haste or pressure.

Alexander Hamilton Institute

Executive Training for Business Men

IN CANADA, *address the Alexander Hamilton Institute, Limited, C. P. R. Bldg., Toronto.*

IN AUSTRALIA, *11c Castlereagh St., Sydney.* In England, *6f Ot. Russell St., London.*

ALEXANDER HAMILTON INSTITUTE
959 Astor Place New York City

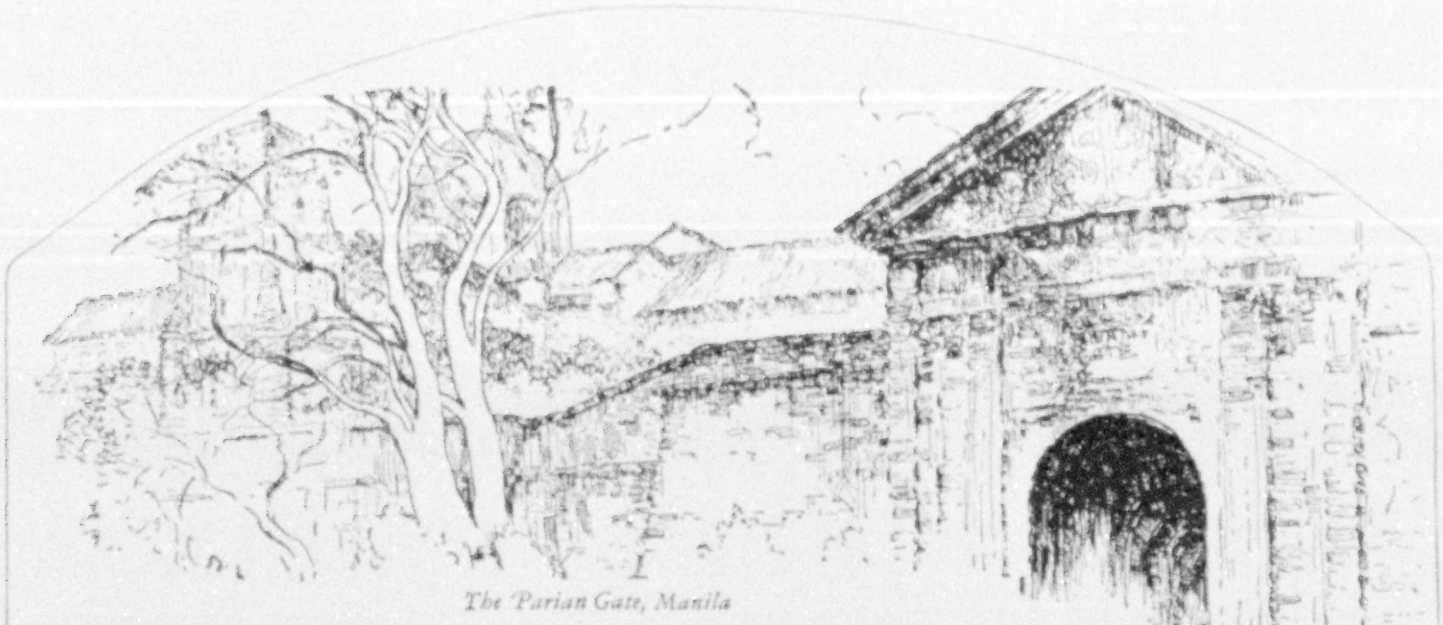
Send me the new, revised edition of "Forging Ahead in Business," which I may keep without charge.

Signature .....
Please write plainly

Business Address .....

.....

Business Position .....



The Parian Gate, Manila

Orient Lands

where keen delight rewards each day's adventuring

Across the Pacific the alluring countries of the ancient East offer you a multitude of fresh experiences. Go now.

Select the cities or countries which most interest you, or make the complete trip and see Japan, China, the Philippines.

You touch at Yokohama, Kobe, Shanghai, Hong Kong and Manila. Each port different in character and in its appeal to the traveler.

Thus you see Japan, a miracle of loveliness and modern progressiveness. China, her ancient cities. Manila, a bit of old Spain in a tropical setting.

Here is the opportunity for new vacation adventures at but small expense. Roundtrip fare to Manila and return by way of Japan and China as low as $750 per capita. (Include Honolulu if you choose.) First cabin accommodations and meals are included.

Or continue Round the World to other lands of keenest interest. Liberal stopovers at any port with identical accommodations on subsequent liners. Like a cruise on a private yacht.

You sail on a magnificent President Liner, aristocrat of ships. Broad of beam and steady. Luxurious and expertly served. You sleep in a bed, not a berth. Rest or relax on wide, sunny decks. Enjoy the world-famous cuisine.

An American Mail Liner sails every two weeks from Seattle for Japan, China and Manila.

A Dollar Liner sails every week from Los Angeles and San Francisco for the Orient (via Honolulu) and Round the World. From Boston and New York fortnightly sailings via Havana, Panama and California. From Naples, Genoa and Marseilles fortnightly sailings for Boston and New York.

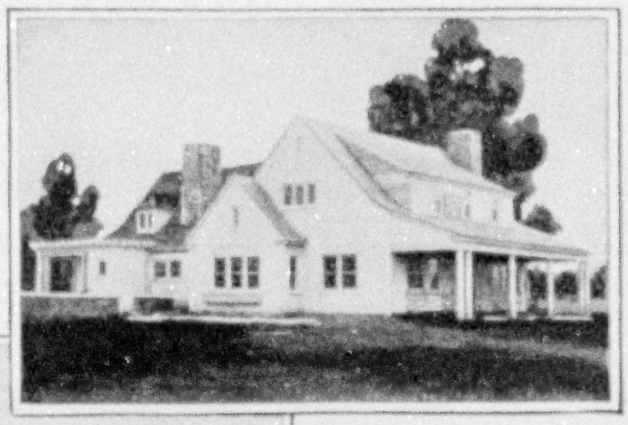
For complete information communicate with any ticket or tourist agent or

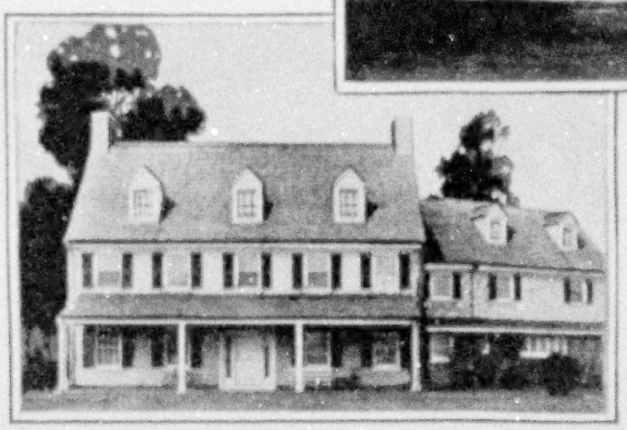
American Mail Line
Dollar Steamship Line

32 Broadway . . . . . New York
604 Fifth Ave. and 25 Broadway . . New York
1018 Bessemer Building . . . Pittsburgh, Pa.
177 State Street . . . . . Boston, Mass.
Robert Dollar Building . San Francisco, Calif.
Dime Bank Building . . . . . Detroit
110 S. Dearborn Street . . . . Chicago, Ill.
101 Bourse Building . . . . Philadelphia, Pa.
514 W. Sixth Street . . . Los Angeles, Calif.
1519 Railroad Avenue South . . Seattle, Wash.

Mr. du Pont has bought his 50th Oil-O-Matic

Chairman of the Board of the great General Motors organization uses oil exclusively for heat on his estate





TWO OF THE TENANT HOMES

On the duPont estate are large and small homes occupied by employees. Heating plants of various types. Yet all enjoy the same comforts. Oil-O-Matic can be connected to your present heating plant, whether it be steam, hot water or warm air.

JUST the bare statement that Pierre S. du Pont has 50 Oil-O-Matic Oil Burners on his estate, answers nine-tenths of the questions on oil heat now in your mind.

And when you read how he came to select Oil-O-Matic—where they are used—the length of time he has had them—and their record of performance—you will realize that your whole problem of heating is answered for you.

Engineer Makes Actual Tests

From his staff of engineers, Mr. Brewer was appointed to determine which oil burner was best fitted to provide economical, uniform, dependable heat. On the basis of engineering excellence, his choice narrowed down to two. But after making actual tests in homes on Longwood Farms, the duPont estate, Mr. Brewer enthusiastically, recommended Oil-O-Matic. He also bought two for his parents' home and father's greenhouse.

This settles the question of comparative merit.

R. P. BREWER

Engineer of maintenance, read an Oil-O-Matic advertisement in the Christian Science Monitor that prompted him to investigate the merits of Oil-O-Matic.

For Any Size Home

Longwood Farms covers 1200 acres of beautifully rolling countryside, near Kennett Square, Pa. The employees and their families dwell on this estate in average size homes. It is into these that Mr. du Pont has placed fifty Oil-O-Matics.

This is your assurance that no home is too small to enjoy all the wonderful benefits of Oilomatic Heat.

Dependable Uniform Heat

The first three Oil-O-Matics were installed on the estate in the spring of 1925. So perfectly did they function that during that summer, 39 more were purchased. These 42 have more than confirmed the engineer's judgment. Eight more have been added as new homes were completed.

In view of this there should be no question as to its dependability. Particularly since Oil-O-Matic has been giving similar satisfaction for 8 years, and more home owners are buying Oil-O-Matic than any other two oil burners combined!

Lowest Operating Cost

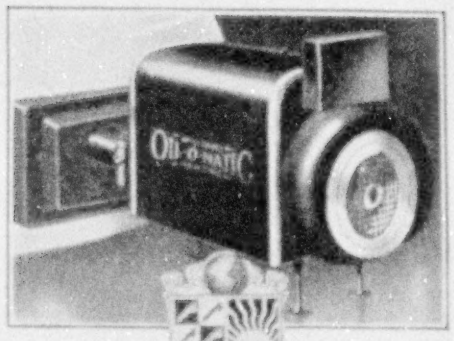
The individual tenants bear the cost of heating their own homes and their satisfaction is the best measure of Oilomatic Heat. You will find their homes spotlessly clean and easy to keep so. They enjoy the comfort of perfectly uniform, automatic heat at a cost equal to the bare cost of coal.

Oil-O-Matic's low operating cost is primarily due to its ability to use heavy oils, lower in price and richer in heat units than the light oils to which most oil burners are restricted. Yet Oil-O-Matic burns light or heavy oil with equal facility.

Small Payment Down

In your community there is a trained oilomatician who has the organization, facilities and financial responsibility to assure you equal satisfaction. For those who wish it, he can arrange terms that make the initial cost of installation insignificant, indeed.

The complete story of all the advantages that have made Oil-O-Matic the undisputed world leader is told in our newest booklet, just off the press. Send for it today.



Williams Oil-O-Matic Heating Corp. Bloomington Illinois NG97

Please send me without obligation a copy of "OIL HEATING at its best."

Name.....

Street Address.....

City..... *State*.....

WILLIAMS OIL-O-MATIC HEATING

FRANK'S
6th Annual

MEDITERRANEAN

CRUISE DE LUXE
Jan. 25, 1928

NEAR EAST
EGYPT HOLY LAND

and practically Every Port of Historic and Romantic Interest

Fascinating Africa, mysterious Egypt, the Holy Land, beautiful Madeira, gay Seville, Granada with its Alhambra, mighty Gibraltar, ancient Cadiz, Algiers, Biskra, Timgad, Tunis, Malta, Dardanelles, Constantinople, Bosphorus, Athens, Venice, Florence, Rome, Naples, Messina, Taormina, Syracuse, Palermo, Monte Carlo, France, England—the glorious Cruise of the palatial Cunarder "Scythia," exclusively chartered (limited to 390 guests—half capacity), will take you to all of these wonderful places, and many others.

The Cruise of the "Scythia" is the Annual Mediterranean classic. The unusually large and comfortable cabins—all with hot and cold running water—the suites and private baths, the spacious decks, the passenger elevators, the famous Cunard service and cuisine and the reasonable rates all combine to offer the most attractive of all Cruises to the Mediterranean.

Free stop-over in Europe, including return by S. S. "Berengaria," "Aquitania," "Mauretania," or any Cunard steamer. Full information on request.

Travel Service throughout
Europe
Independent or With Escort, Securing All Reservations in Advance. Send for Book E.

FRANK TOURIST CO.
(Est. 1875) 542 Fifth Avenue, New York
Philadelphia, 1529 Locust Street, Boston, 33 Devonshire Street
San Francisco, 582 Market Street, Los Angeles, 756 So. Broadway
Chicago, 175 North Michigan Avenue

ZEISS PRISM BINOCULARS

Zeiss Binoculars have become "standard equipment" with professional explorers, guides, navigators, etc. They are also the choice of that great army of outdoor Americans who are satisfied with nothing but the best.

At leading opticians', camera dealers', and sporting goods stores. Write to us for Catalogue.

CARL ZEISS INC
485-D FIFTH AVE., NEW YORK
Pacific Branch: 728 So. Hill St., Los Angeles, Cal.

FRIGIDAIRE

NO SACRIFICE TOO GREAT TO KEEP HIM WELL AND HAPPY

Yet how often is the simplest health precaution disregarded! Don't deny *your* baby this protection. It costs so little. And he needs it *now*—to help him ward off dangers from which no home is quite immune.

Frigidaire Provides Refrigeration 5° Colder Than Government Standards!

Throughout the year—in fall and winter—as in summer—your baby's health is menaced by the gravest of all dangers—food contamination. Guard against it, science warns us.

This warning is repeated in Bulletins issued by the U. S. Department of Agriculture and by Health Boards in leading American cities. They tell us that high or fluctuating temperatures in refrigeration actually *invite* food contamination. That a *constant*, low temperature is a vital necessity if baby's foods are to be safely kept. These authorities set the Safety Line in refrigeration at 50°. Above that point, they say, lies danger!

Now note how Frigidaire goes a step beyond accepted standards. Direct Frost-Coil Cooling maintains a constant, cold-storage temperature in the food compartment that is actually 5° *colder than Government requirements.* In other words, here is a 5° *Margin of Safety* as an added health safeguard. No wonder hundreds of thousands of users have been won to Frigidaire—more than have bought all other electric refrigerators combined.

FRIGIDAIRE'S constant, cold-storage refrigeration keeps foods fresh and wholesome four to five times longer than usual. Even milk—if it's fresh when you buy it—stays sweet for days at a time. How priceless this protection when there's a baby in the home! And of what avail all other loving care if this one precaution is neglected!

The feeling of security that Frigidaire brings to your home is beyond all price. Yet you pay so little for it. Complete Frigidaire models—all ready to attach and operate from any convenient electric outlet are now priced at only $195 f. o. b. Dayton—the lowest price in Frigidaire history.

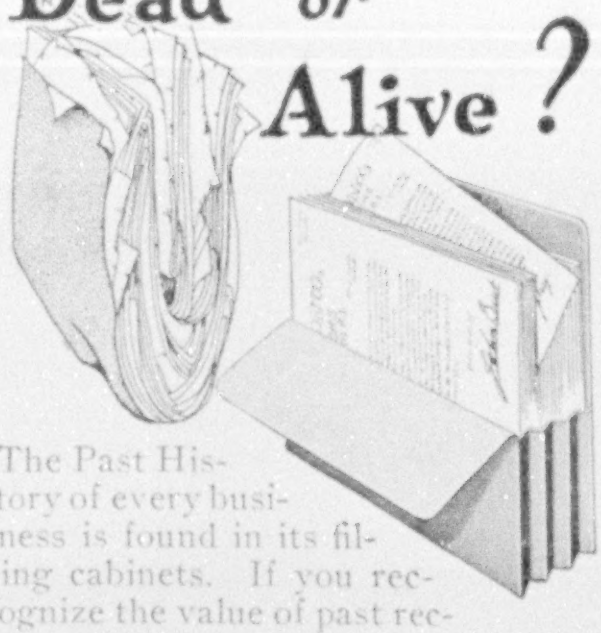
All Frigidaires, regardless of size or price, are available under liberal General Motors terms. First a small deposit. Then a little each month out of income.

Visit the nearest Frigidaire Salesroom today. Provide your baby this protection that no one else can give.

FRIGIDAIRE CORPORATION
Subsidiary of General Motors Corporation
Dept. Y-306, Dayton, Ohio

PRODUCT OF GENERAL MOTORS

Is Your Past Dead or Alive?



The Past History of every business is found in its filing cabinets. If you recognize the value of past records in charting the future, you will not neglect your files. Bushnell's

Vertex VERTICAL-EXPANDING **File Pockets**

are firm, durable, expansible containers specially designed to hold thirty or three hundred letters as efficiently as ordinary folders hold three. They always stand upright in the filing cabinet with their index tabs in plain view; the chance of misfiling or lost papers is practically eliminated. Bushnell "Vertex" File Pockets will keep your letters and papers safely, orderly and ready for instant reference.

You probably have a number of overloaded folders in your files that lack these advantages.

If you use vertical files, the coupon below will bring you a sample "Vertex" Pocket which we urge you to try in the place of one of these crowded folders. There is no obligation on your part.

CUT HERE

Please send me for trial in my files a free sample of Bushnell's Paperoid "VERTEX" File Pocket, as described in September, 1927, NATIONAL GEOGRAPHIC MAGAZINE.

Name of Firm .....

Address .....

Name and Position of Person Inquiring.....

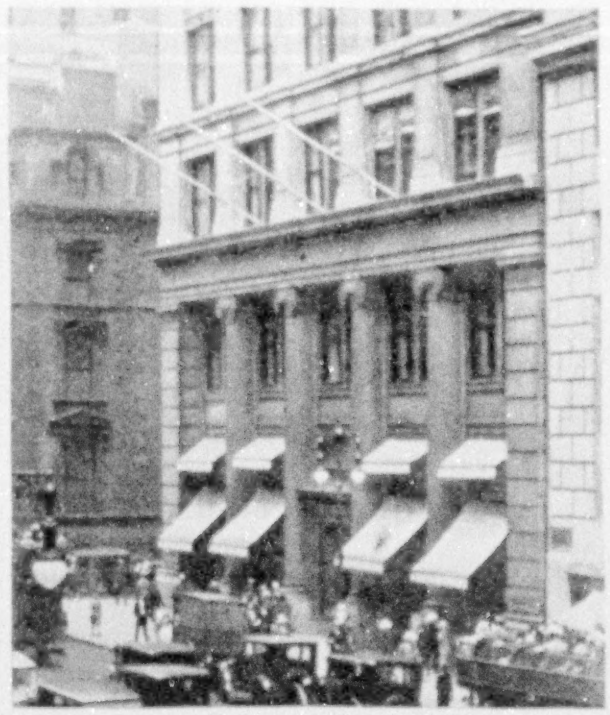
.....

Letter Size or Legal Size Desired?.....

.....

To ALVAH BUSHNELL CO., Dept. G.
13th & Wood Streets Philadelphia, Pa.

FOR TRAVELERS



The Fifth Avenue establishment of W & J Sloane, the famous floor-covering and furniture house of New York, Washington and San Francisco.

"SAFE TRAVEL FUNDS"

says W & J SLOANE

"Traveling as they do to out of the way and in some cases, hazardous markets, our buyers must have traveling funds which are absolutely safe; that is why we supply them with A·B·A Certified Cheques. They are accepted everywhere, and afford complete protection against loss or theft."

This is the statement of Mr. George H. Stevenson, Director of W & J Sloane, the well-known Fifth Avenue furniture and floor-covering establishment.

A·B·A Cheques are the only certified travel cheques enjoying world-wide acceptance. Experienced travelers recommend them highly for use in the United States or abroad, because they are so readily cashable.

Buy Them at Your Bank

A·B·A Cheques are certified by Bankers Trust Company, New York, Agent for the issuing banks, and are the only authorized travel cheques of the American Bankers Association.

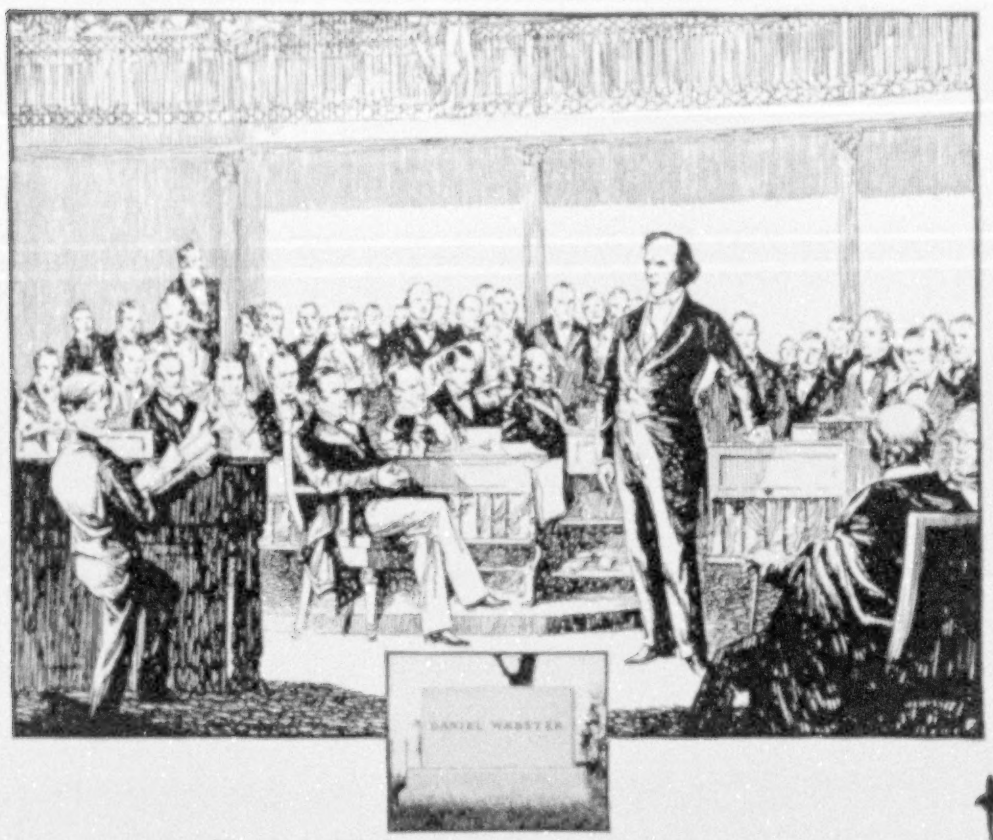
FREE: *If going abroad, buy A·B·A Cheques from your bank and get your complimentary copy of Harry Franck's invaluable book, "All About Going Abroad", sold in bookstores for $1.00.*

AMERICAN BANKERS ASSOCIATION

A·B·A *Certified* **CHEQUES**

TRAVEL MONEY

BANKERS TRUST COMPANY, NEW YORK
Agents for the issuing banks



Daniel Webster, statesman and orator, is buried in the Webster family plot on his old estate at Marshfield, Mass.

Your memorial is the outward sign of your most sacred memories and thoughts and hopes. It is not for the present only, but for all time. Can you accept aught in conception, workmanship, or material unless it be of enduring worth or beauty?

Rock of Ages

"The Flawless Barre Granite"

Number Seven of a Series

Daniel Webster

Eminent lawyer, powerful in argument and debate; distinguished statesman and incomparable orator, whose eloquence, rising to inspired heights in his reply to Hayne, saved our country from the fatal doctrine of nullification.

"Mark Every Grave"

Our Certificate of Perfection, when requested from any memorial dealer, assures you of our personal inspection through the various stages of completion and is your perpetual guarantee against defective workmanship and material.

Write for Booklet "G"

ROCK OF AGES CORPORATION
BARRE, VERMONT

Do You Make these Mistakes in ENGLISH?

Sherwin Cody

Many persons say, "Did you hear from him today?" They should say, "Have you heard from him today?" Some spell calendar "calender" or "calander." Still others say "between you and I" instead of "between you and me." It is astonishing how many persons use "who" for "whom," and mispronounce the simplest words. Few know whether to spell certain words with one or two "c's" or "m's" or "r's", or with "ie" or "ei." Most persons use only common words—colorless, flat, ordinary. Their speech and their letters are lifeless, monotonous, humdrum. Every time they talk or write they show themselves lacking in the essential points of English.

Wonderful New Invention

For many years Mr. Cody studied the problem of creating instinctive habits of using good English. After countless experiments he finally invented a simple method by which you can acquire a better command of the English language in only 15 minutes a day. Now you can stop making the mistakes which have been hurting you. Mr. Cody's students have secured more improvement in five weeks than previously had been obtained by other pupils in two years!

Learn by Habit—Not by Rules

Under old methods rules are memorized, but correct habits are not formed. Finally the rules themselves are forgotten. The new Sherwin Cody method provides for the formation of correct habits by calling to your attention constantly only the **mistakes you yourself make** and then showing you the right way, without asking you to memorize any rules.

One of the wonderful things about Mr. Cody's course is the speed with which these habit-forming practice drills can be carried out. You can write the answers to fifty questions in 15 minutes and correct your work in 5 minutes more. The drudgery and work of copying have been ended by Mr. Cody! You concentrate always on your own mistakes until it becomes "second nature" to speak and write correctly.

FREE Book on English

A command of polished and effective English denotes education and culture. It wins friends and makes a favorable impression upon those with whom you come in contact. In business as well as in social life correct English gives you added advantages and better opportunities, while poor English handicaps you more than you now realize. And now, in only 15 minutes a day—in your own home—you can actually see yourself improve by using the 100% self-correcting method.

A new book explaining Mr. Cody's remarkable method is ready. If you are ever embarrassed by mistakes in grammar, spelling, punctuation, pronunciation, or if you can not instantly command the exact words with which to express your ideas, this new free book, "How to Speak and Write Masterly English," will prove a revelation to you. Send the coupon or a letter or postal card for it now.

SHERWIN CODY SCHOOL OF ENGLISH

389 Searle Building, Rochester, N. Y.

SHERWIN CODY SCHOOL OF ENGLISH
389 Searle Building, Rochester, N. Y.

Please send me your free book, "How to Speak and Write Masterly English."

Name .....

Address .....

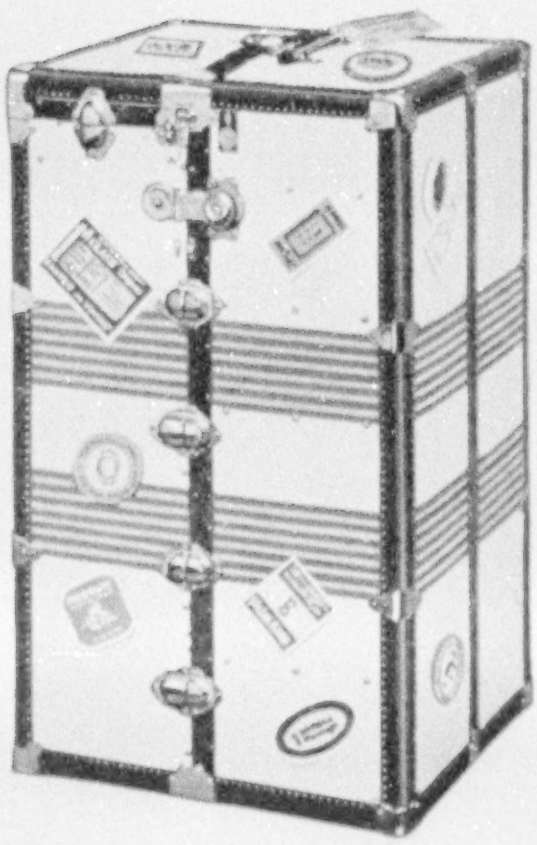
City .....

YES, we know of one case when an Oshkosh owner had trouble with his trunks. On his last trip around the world, some discriminating Chinese bandits took them away from him.

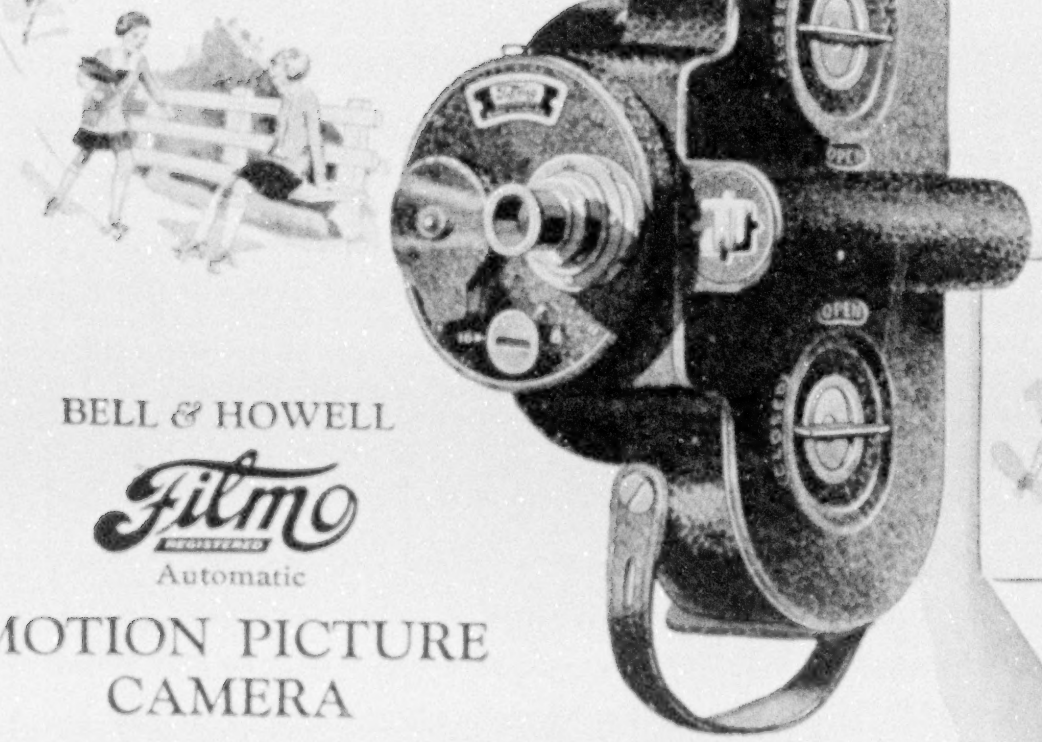
An attractive descriptive booklet, "Your Home Away From Home," will be sent you on request to 466 High Street, Oshkosh, Wisconsin

OSHKOSH TRUNKS

THE OSHKOSH TRUNK COMPANY
Oshkosh, Wisconsin, and New York City



In your hands-*this* Camera CAPTURES LIFE!

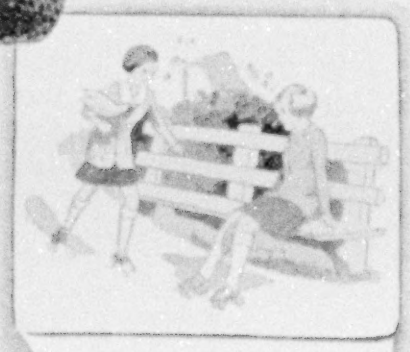


BELL & HOWELL

Filmo

Automatic

MOTION PICTURE CAMERA



Filmo

Automatic

PROJECTOR

Re-creates it!

Show your own movies with Filmo Projector. This is the same high quality Projector as used by leading industrial firms for showing their "sales" or "good-will" motion pictures.

IN the beautiful month of August, on the threshold of Autumn, your love for all out-of-door activities will find fullest expression in *motion pictures* you take and show with *Filmo* motion picture Camera and Projector.

Most of the flexibility of operation found in the larger Bell & Howell Cameras (with which nearly all theatre movies are made) is found in *Filmo* Camera.

It is the one amateur movie camera adaptable to all reasonable conditions of light, distance and speed. Remarkably simple to operate. Simply look through the spy-glass viewfinder and press the button to take movies.

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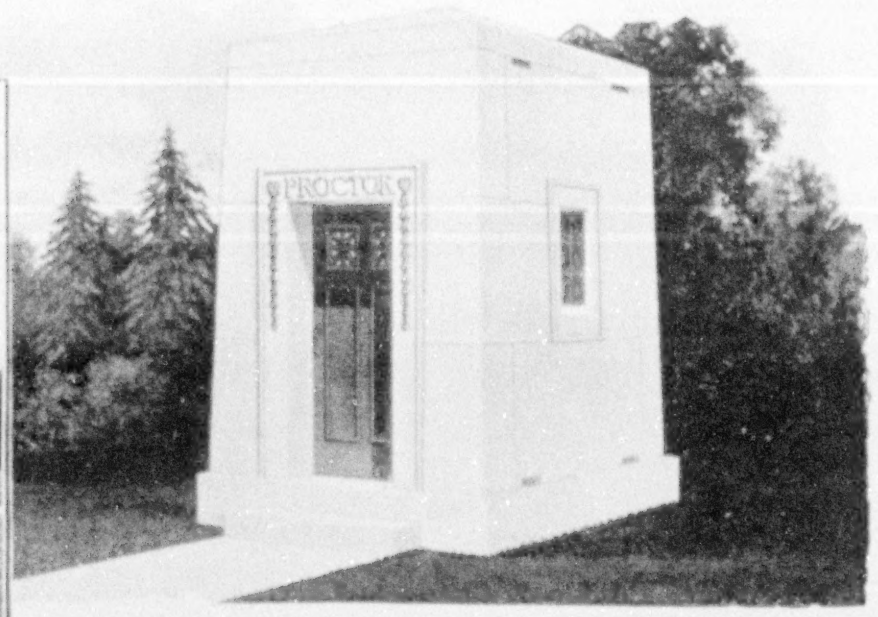

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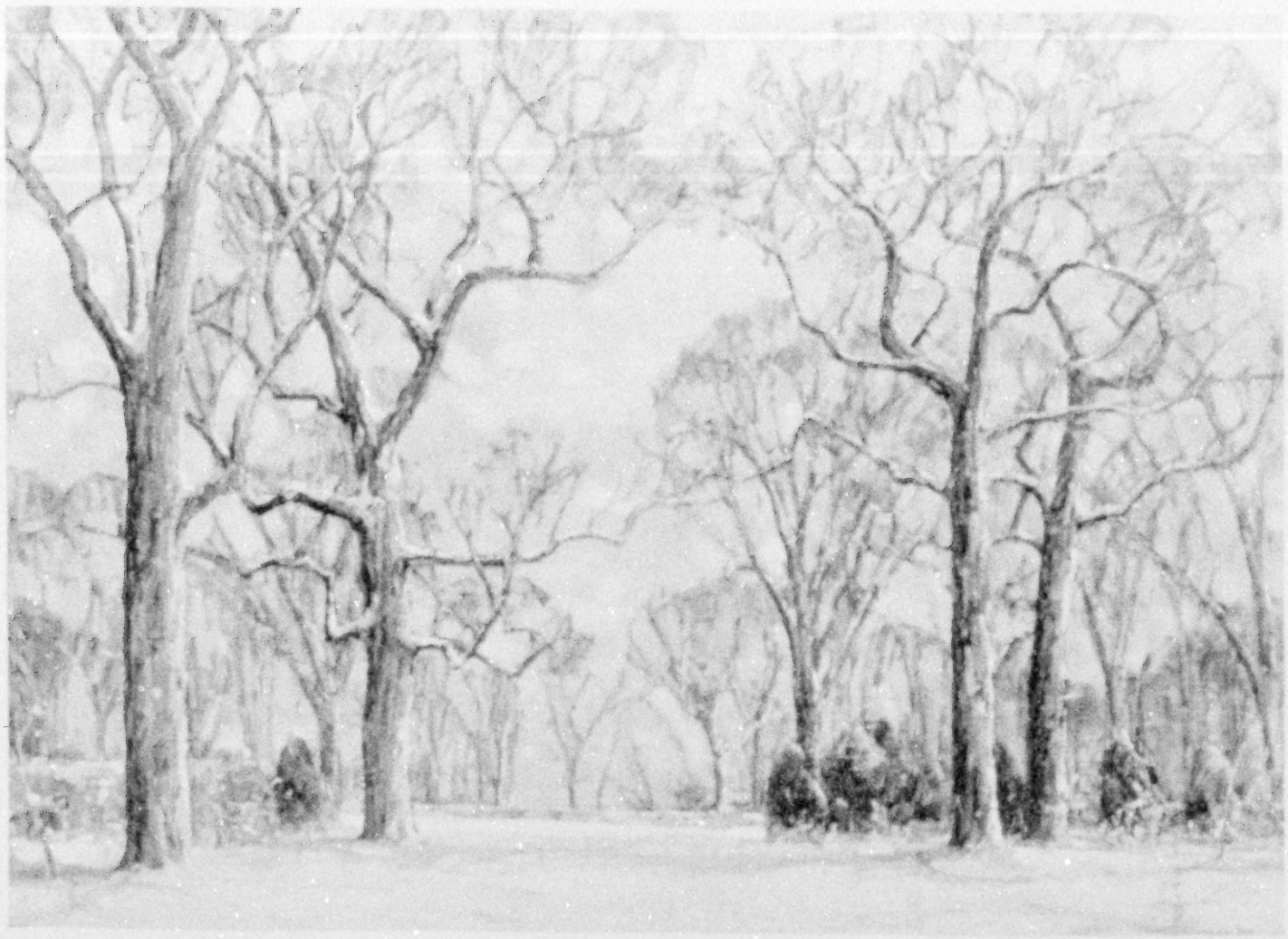

Reproduction from a painting made on the estate of Vice President Charles G. Dawes, Evanston, Illinois, by Frank Swift Chase

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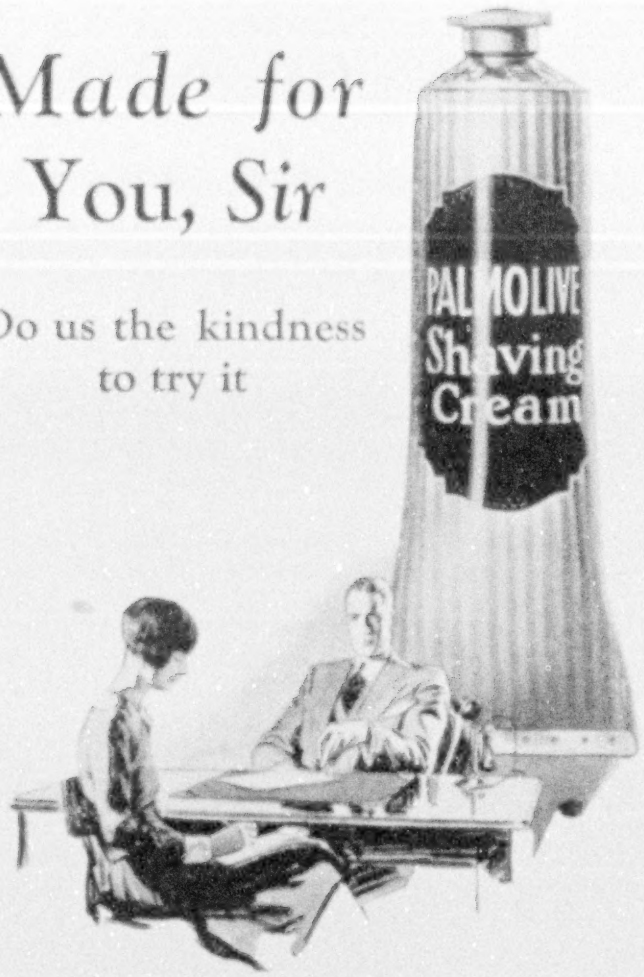

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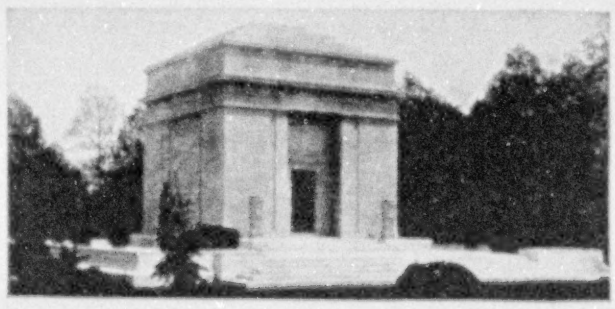

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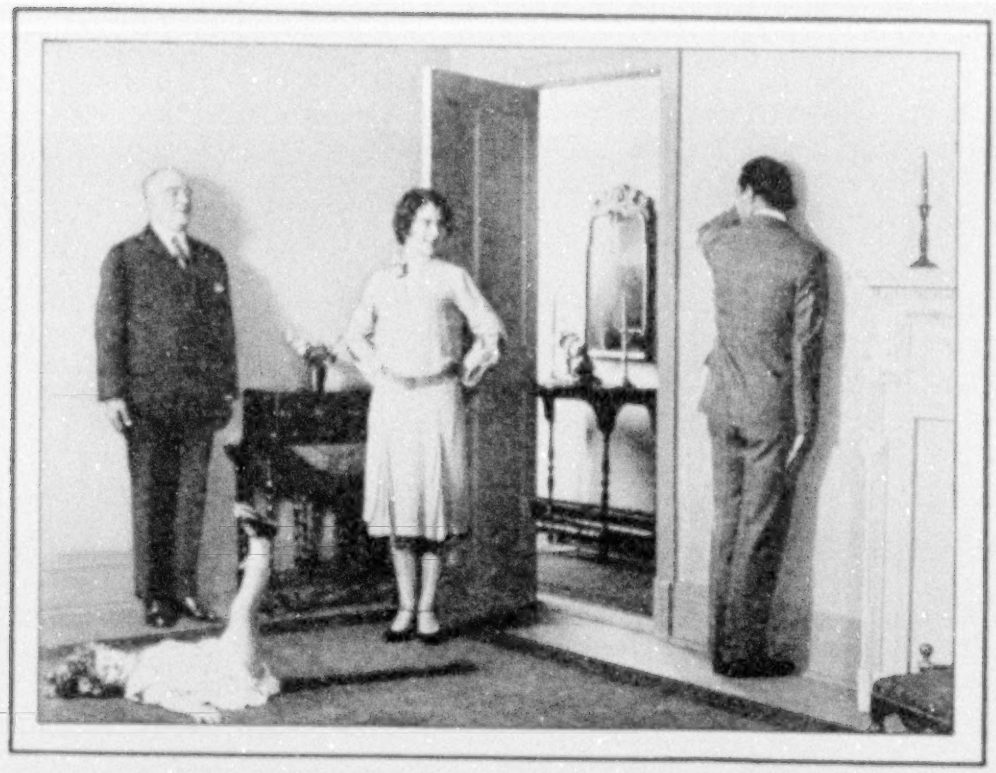

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CAN you touch the wall with the back of your head, shoulders, hips, calves of your legs and heels, and hold this position as you walk away from the wall?

Or grasp the two knobs of a door and make every inch of your spine touch the edge of the door?

Or touch the wall only with chest and toes, then step back and hold your body in the same position?

Now stand naturally and ask some candid member of the family whether or not you stand correctly with head up, chin in, back straight, shoulders flat, abdomen in, weight on the balls of your feet.

WHY stand straight? For better appearance? For added poise and dignity? For self-confidence and courage? All of these—but, most of all, because a straight body, carried correctly, gives one better health and added strength. It frequently corrects physical troubles that no amount of medicine will cure.

Much of your nervousness, your fatigue, your headaches and backaches, your "rheumatic" pains and the possible poisoning from intestinal sluggishness, often may be traced to faulty posture.

Your heart, lungs, stomach, kidneys, liver—working machinery of the body—are meant to be free and uncrowded.

When you "stand tall" and hold your spine straight, these organs have sufficient room to carry on their work.

When you slump over with rounded shoulders or spine curved in at the waist, you squeeze the organs together. The free action of your heart is threatened. Your stomach and liver cannot do their work so well. The kidneys may be forced out of place. Your blood cannot circulate so freely—some parts of your body may get too little blood, others too much.

When your chest is contracted your lungs cannot expand. Shallow breathing starves your blood for the life-giving oxygen which every part of your body must have.

It is not necessary to have a perfect figure to stand or sit properly. But a perfect body can be ruined by bad posture.

Progressive Boards of Education, all over the country, recognize that pupils must sit properly during study hours. Curvature of the spine is sometimes caused by desks and chairs which do not permit the child to sit straight.

In the Home Office of the Metropolitan Life Insurance Company striking physical improvement among our employees has been brought about by our Director of Posture. Bent bodies have been straightened. Headaches and other ailments of obscure origin have been made to disappear.

A valuable booklet on the subject of posture has been prepared and one copy will be mailed free to each person requesting it. Send for "The Importance of Posture".

HALEY FISKE, *President.*

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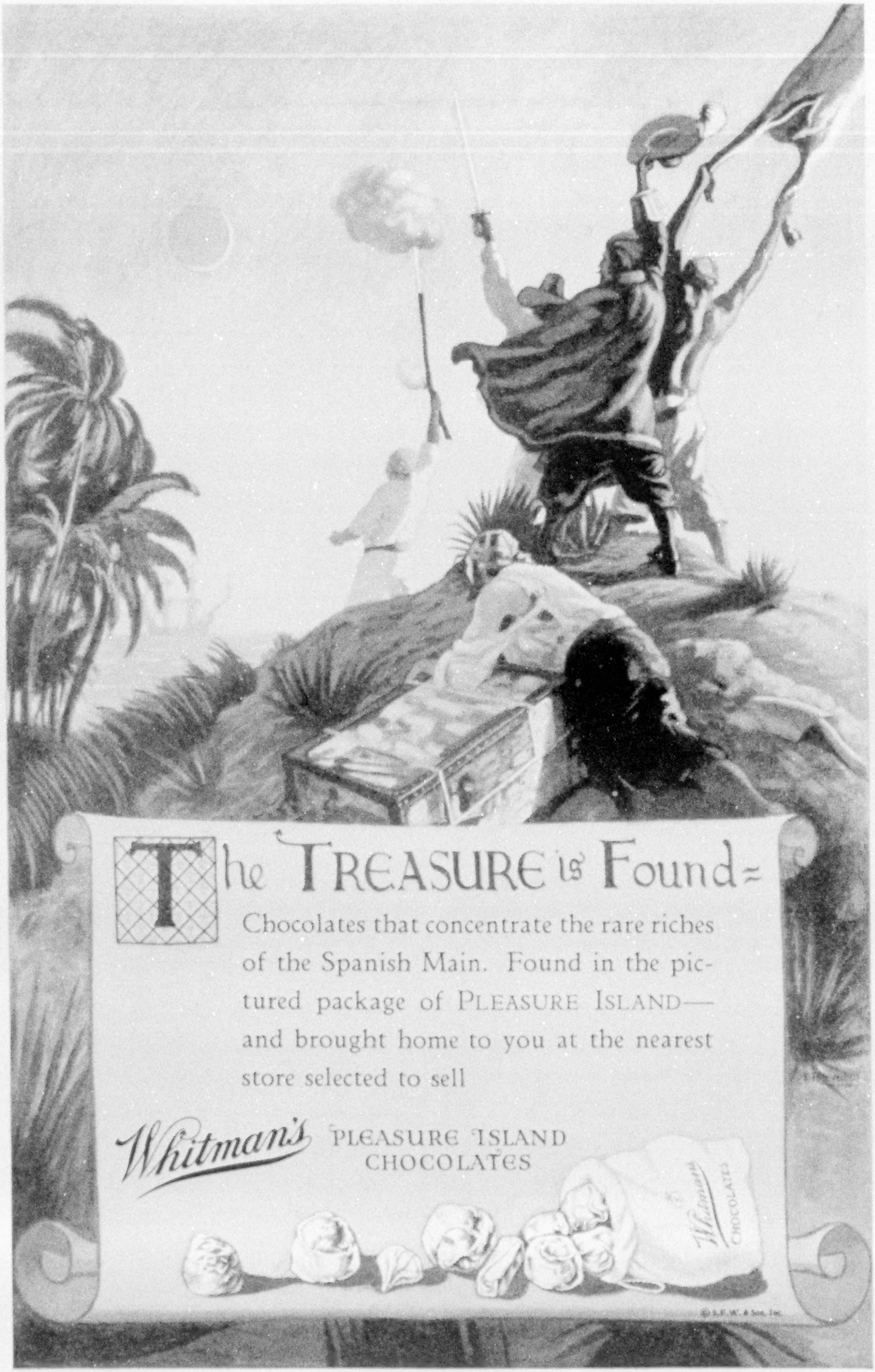

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VOL. LII, No. 3 WASHINGTON SEPTEMBER, 1927

THE NATIONAL GEOGRAPHIC MAGAZINE

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THE GREAT MISSISSIPPI FLOOD OF 1927

Since White Man's Discovery This Mighty River Has Served Him Well, Yet It Has Brought Widespread Devastation Along Its Lower Reaches

BY FREDERICK SIMPICH

AUTHOR OF "SINGAPORE, CROSSROADS OF THE EAST," "MISSOURI, MOTHER OF THE WEST," "ALONG OUR SIDE OF THE MEXICAN BORDER," ETC., ETC., IN THE NATIONAL GEOGRAPHIC MAGAZINE

With Illustrations from Photographs by Clifton Adams, Staff Photographer

SINCE time began, the fact that water runs downhill has warped the fate of men and nations. In Babylonia kingdoms fell with floods and the famines that followed. Some say a Hebrew prophet could foretell the Seven Lean Years because he knew the habits of the Nile. The Mongols, cutting the Tigris levees, conquered Baghdad. In China more men drown than die in battle. One Yellow River flood claimed more than a million who drowned or starved.

So, through the ages, man's fiercest fight has been to save his land from flood and famine—a fiercer fight by far than any war ever waged against a hostile kingdom.

MAN STRUGGLES VAINLY FOR PERFECT FLOOD CONTROL

Along the Rhine and Danube, the Volga and Yellow; along the Tigris, Indus, and Euphrates; along our own cruel Colorado and marauding Mississippi, man has long matched his wits against the powers of Nature.

When white men founded New Orleans, 200 years ago, they had to throw up dirt banks to bar the river from their rude camp. From that day to this, with men, mules, machines, and money, the towns and planters along the river, aided in more recent years by the Government, have fought a losing fight against the floods.

It is a stupendous struggle. Its battle front is flung from the Ohio to the Gulf. In heat, mud, and miasma, slaving men and sweating animals, toiling through the years, have thrown up 2,500 miles of huge, fortlike levees. Higher and higher they build them, hoping always that some day, somehow, they may achieve perfect flood control.

But hydraulic principles are stubborn. They will not compromise with man's puny plans. The levees, as built, have turned once vast, empty swamps into rich, thickly inhabited areas and added hugely to our national wealth. Five years out of six they may hold; to that extent they are successful; but when the river rises high enough it breaks them. In the great floods of the eighties the levee system broke in 712 places. It had often broken before. It has often broken since.

Now, as I write this, it is breaking again. To-day the most destructive flood

"YES, WE HAD BREAKFAST, BUT WE HAVE NOTHING TO PLAY WITH"

It was not easy to explain to children why pets and toys had to be abandoned when families fled before the rising floods. At Natchez, Mississippi, Secretaries Hoover and Davis visited the youngsters in camp. One bashful boy, dodging the camera, hid behind the friendly coattails of Mr. Hoover.

in all the annals of this rapacious river is rolling from Cairo to the sea.*

Parts of seven States are under water. Nearly 800,000 people have been driven from their homes or rescued from housetops, trees, levees, and railway embankments.

To save New Orleans, levees are blown up. Tons and tons of dynamite are used, throwing masses of mud and driftwood high into the air, repicturing in a way the shell-torn fields of France in war times.

* Major Simpich was assigned to write an eyewitness account of the flood, which ranks as a major geographic phenomenon of our time; therefore much of his narrative is a record of direct observation in the present tense.

In the flood's wide path from Arkansas to Louisiana, unknown thousands of farm animals have been drowned, marooned on mounds and levees, or here and there rescued by cruising boats. To avoid pestilence, the Red Cross uses oil by the carload to burn dead mules, horses and cows.

To human victims of the flood more than 50,000,000 grains of quinine have been given and more than half a million people inoculated against disease.

Final property loss may be nearly a billion dollars.

The whole Nation, at first amazed and appalled, quickly and magnificently rallies

Drawn by James M. Darley

DISTANT TRIBUTARIES HELP MAKE LOWER MISSISSIPPI FLOODS

With 31 States and two Canadian provinces drained by the Mississippi and its half a hundred tributaries, it is easy to see why, in rainy years, there should be high water in the lower valley. In 1927 parts of seven States were inundated (see text, page 244).

with millions in money, with trainloads of clothing and food to comfort hungry, helpless victims of the worst American flood of all time.

"It is the greatest peace-time disaster in our history," said Herbert Hoover. "We are humble before such an outburst of the forces of Nature and the futility of man in their control."

THE FLOOD AREA PRESENTS A DISMAL PICTURE

I write now on board a stern-wheel relief boat, cruising *among the tree tops* of Louisiana. Doré, who gave us his version of the Deluge, could not exaggerate this aspect of desolation.

But for the rainbow and His promise, victims of this cataclysm might well believe, as they cling to their heaving housetops in a wind-tossed, stinking sea, that another great flood has come to drown a sin-cursed world. Small wonder that some of the ignorant, in their terror, fear the Great Lakes have burst and are sweeping over the South!

Picture to yourself, if you can, this astounding panorama of watery waste and human misery:

First, rains that fell for months over 31 States and two Canadian provinces drained by the Great River, comprising an area of 1,240,000 square miles. This rainfall would amount to nearly a foot of water spread over that vast area—that is nearly 250 cubic miles of water! Much of this evaporated or soaked deep into the earth; but more than 60 cubic miles of it had to reach the Gulf.

Then the Mississippi Basin, like a giant funnel, its wide top stretching from New York out to Montana, yet forcing all its

Official Photograph, U. S. Army Air Corps

IN MANY FLOODED RIVER TOWNS PRACTICALLY THE ENTIRE POPULATION FLED TO THE LEVEES

By an odd whim of the rising waters, at one time the crest of the flood was higher behind the levees at Arkansas City, shown here, than it was in the main channel of the Mississippi. Tents that house refugees are shown on the levee. In the foreground is a flooded lumberyard.

Official Photograph, U. S. Army Air Corps

A GOOD FLAGMAN IN ARKANSAS MUST ALSO BE A GOOD SWIMMER

With many of their bridges gone and much of their track under water, railways operated wherever possible. Often, with water up to the engine's firebox and brakemen wading ahead, feeling to see if rails were still there, trains crawled through the yellow, swirling sea. Courageously, day and night, train crews worked to save people, household goods, and livestock.

Photograph Courtesy Mississippi River Commission

TREATED THIS WAY, A "SAND BOIL," CURES ITSELF

The river's increasing pressure against a levee, during high water, sometimes forces tiny streams through the otherwise solid levee. Sandbag dams, built about the spot where the muddy rivulets trickle through, tend to stop them with the settling sediment.

flow through a spout which gets narrower and narrower as it nears the Gulf.

So now, from Arkansas to Louisiana, a foul and swirling sea, bearing on its yellow tide the offal, animals, trees, and trash, the fences, bridges, houses, barns, and chicken coops scoured down by 54 flooded tributaries.

From Cairo, from Little Rock, from Memphis, far down through the lowlands to where Evangeline searched for her lover, the waters wreak their wrath. Levees tumble and farms are flooded. Swollen, crowded bodies of mules, hogs, horses, and cows glut the bayous. Buzzards come, and on the levees wolves prey on the deer, tired from swimming.

Far and wide, rescue steamers churn the yellow tide, hauling bargeloads of silent, stupefied people, coaxed from their perilous retreats. Overhead roar the scout planes. As soaring, keen-eyed hawks scour a field for hiding quail, so these planes seek out groups marooned on levees or housetops; then whiz back to report, that rescue boats may be sent.

On levees, ridges, ancient Indian mounds, wet, miserable man huddles with his domestic animals. Crawling up from the flood come foxes, rabbits, quail, deer, wild turkey, to climb freely over man's piled-up furniture, bedding, and bundles, unmindful now of him and his dogs. Only the snake is denied refuge. Animals shrink from it; man kills it. Probably it was so in the first flood (p. 269).

STEAMBOATS CRUISE THROUGH FORESTS

Devastation over wide areas. Straight lanes of water through forests, meaning that beneath the flood a highway runs. Up one of these our steamboat cruised, fifteen feet above some lovers' favorite lane. Fallen steel bridges, box cars floating. Abandoned railroads. Ruined sawmills and sugar refineries. White-pillared plantation houses in water to their upper verandas. Relief workers in frail boats breasting the evil currents. Levee workers and levee engineers helplessly waiting for the waters to recede, so they can build more levees for later floods to conquer.

Photograph from Acme News Pictures

AN UNSUNG HERO OF THE FLOODS

The man in the river is a diver. When it was decided to dynamite the levee below New Orleans to spare that city from the perils of rising water, he went down into the dark, muddy waters of the Mississippi to lay the charges (see text, pages 273 and 285).

Tens of thousands might have died; it was feared they would, but from that very fear came nation-wide action. Overnight, almost, the great flood; and how to save the people in its path became America's job. The President urged it; the flood-relief group, manned from his Cabinet, directed the monumental task; every needed Federal force was united. Thousands of citizens volunteered with money, railroads, and ships.

What with radio, telephones, airplanes, trains, and boats, all grouped and guided by the Red Cross, imperiled populations in cities, counties, and whole sections of river States were saved from drowning. In all the history of organized effort to save human life, it is doubtful if ever there was a struggle like this—or such a successful one.

When this appalling disaster broke, the American Red Cross moved swiftly. Acting for President Coolidge, the Secretary of Commerce, Herbert Hoover, set up at Memphis a special Flood Relief Headquarters. Here came quickly the key men of the Red Cross staff from all over the Union. To work in liaison, there came also officers of the Army, Navy, Public Health Service, Coast Guard, Department of Agriculture, Veterans' Bureau, and the railroads which serve the flooded area. Altogether, this is the most effective relief force ever put afield in America, barring the days of the World War.

In each region where flood threatened, prominent men and women, capable of leadership, dropped all personal affairs and volunteered for service with local chapters of the Red Cross.

WARNING SAVED THOUSANDS OF LIVES

With wires, radio, scout planes, speed boats, and motor cars where roads were still open, an amazingly efficient intelligence service was swiftly set up. Aided by Weather Bureau predictions of the flood's advance, there was time to warn towns, cities, and even whole counties of impending peril. Tens and tens of thousands, saved by such warnings, fled from the lowlands.

They fled as the Children of Israel

FLOOD-RELIEF HEADQUARTERS WERE SET UP AT MEMPHIS

Across the wide, yellow floods, Red Cross workers flew in Army and Navy seaplanes on errands of mercy. From the Naval Air Station at Pensacola, Florida, 40 planes were sent for flood-relief work, and from the Army and the Marine Corps also came aircraft of land and amphibian types (see, also, text, page 273).

fled through the Red Sea, driving their livestock with them, carrying children, food, and hastily gathered household goods. But for these warnings, made possible by modern invention, more lives must have been lost in this flood than America gave to the battlefields of Europe.

Yet, efficient as the big intelligence machine is, and diabolically deliberate as are the yellow, sewerlike waters pushing down the broad valley, many bewildered people either failed to get warning or did not heed it; for, as I write this on board a rescue boat, days after local warnings were sent, thousands of survivors are trapped on levees, in the second stories of their houses, or in barn lofts.

To find and save helpless, hungry humanity, the huge rescue force of the Red Cross—a motley, mobile fleet, ranging from Navy tugs and Coast Guard cutters to commandeered steamers, barges, and fishing craft—is busy from dawn till dark. Even through the night many bigger boats cruise on, crashing over tops of submerged trees, steaming boldly among floating houses or up village streets, where no steamer ever cruised before, flashing huge searchlights into the night, seeking men huddled here or perched there, above the evil, yellow sea.

Now and then boats come too late. One man, when he felt his house floating, got his wife and children out a bedroom window and up a tree. This feat exhausted him. He had barely strength left to pull himself from rising water

TONS AND TONS OF DIRT SHOT HIGH INTO THE AIR

Fighting against the warring waters, men dynamited the levees to relieve pressure at points upstream. In this shot 1,500 pounds of dynamite were discharged by using the hand-magneto shown in the foreground. Many small turtles, resting near the levee's edge, met a sudden end by the jar of the blast (see, also, illustration, page 270).

and climb up beside his family. In the cold rain and wind, it was not easy for the women and small children to hold on to the swaying boughs. Rescue boats happened along at dawn. But the man was alone!

NOT EVEN A FLOOD CAN QUENCH A MULE'S CURIOSITY

A clumsy, creaking, weather-beaten old side-wheeler was one rescue boat I saw creep in. But to the 800 cold, wet people who huddled, hungry and miserable, on her dirty decks, she probably seemed the finest ship afloat. On a barge she towed were piled the pitiful, shabby furnishings of many a humble plantation tenant home. Over bundles of bedding, dogs and children crawled; amid piles of rickety furniture, tin tubs, and hastily gathered utensils and tools, the family mules and cows were tethered.

Among all living things, in this universal distress, only the mule remained alert and curious. With long ears pointing this way and that, snorting now and then to show his astonishment, he missed no new thrill of airplane roaring overhead or high-power surfboat scooting by. Tired cows, being driven ashore, simply bawled, and bawled, in unmistakable notes of bovine worry. One man, on a horse, carried on the saddle before him a young calf, too weak to walk. There were men carrying clocks, too, and guitars.

Forward, on the deck, after the boat had docked, a small group of old women began singing hymns. And, heedless of the hymn-singers, a gum-chewing, giggling maid of the marshes, skylarking

"THE LOWING HERD WINDS SLOWLY"—THROUGH THE HIGH WATER

These cattle were driven to safety from around New Iberia, in the Bayou Teche country of Louisiana. Despite well-organized rescue work, thousands of head of livestock perished. Mules, more than other animals, saved themselves by swimming; swine were the first to drown. In many regions practically all poultry was lost.

Official Photograph, U. S. Army Air Corps

"AND THE WATERS PREVAILED EXCEEDINGLY UPON THE EARTH"

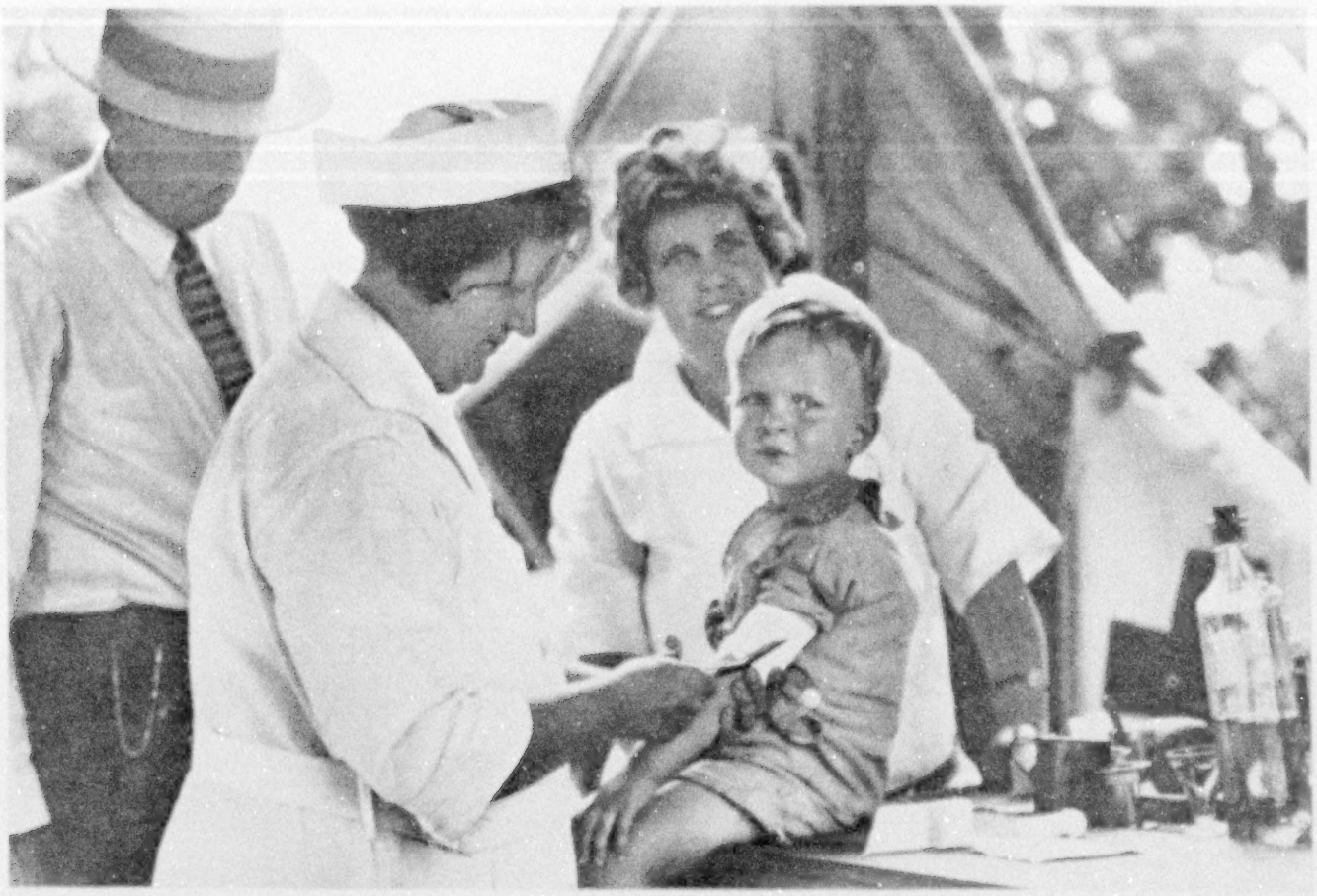
To Noah's dove, hunting an olive leaf, this prospect might have been pleasing; but it brought only grief to the Arkansas farmer, anxious to plant a belated cotton crop. Photographed near Pendleton, Arkansas, where the Mississippi levee also broke (see, also, text, page 256), this picture gives a clear idea of the flooded areas from the air, from southeast Missouri down to the Atchafalaya Basin of Louisiana.

MOURNFUL BAWLING HINTED THAT EVEN COWS FEARED THE FLOODS

Too tired to frisk or "high-tail" it, sadly lowing in bovine perplexity, thousands of cattle were rescued from the lowlands. This herd is being landed at Natchez. Many cattle marooned on levees became so hungry that they ate empty jute bags and old newspapers.

"HOLD STILL, SISTER! IT WON'T HURT YOU!"

To prevent the outbreak of disease, all refugees arriving at Red Cross camps were required to be immunized. Those submitting here to vaccination are "Cajuns," as Acadians of the Evangeline country of Louisiana are sometimes called.



THAT'S A BRAVE LITTLE MAN—HE DIDN'T CRY!

To care for casuals, nurses and hospital tents were provided by the Red Cross in all of the larger concentration camps. This young lad, after a minor accident, is having his arm dressed in the refugee camp set up in the Confederate Cemetery at Vicksburg, Mississippi.

BLUE MONDAY IN A SYLVAN SETTING

Even with community singing, under the friendly shade of picnic-ground trees, one could hardly say that washing clothes is a popular form of sport; but in the model Red Cross camp at Natchez these refugee women went happily at their task, singing and chatting as they worked.

A "SEAGOING LAWN MOWER" THAT CRUISED OVER TREE TOPS

Seeking marooned flood victims, boats as large as this often steamed boldly from the river channel across flooded fields and even over half-submerged tree tops. This craft saved both men and animals from the waters (see, also, text, page 250).

with the sunburned crew, boldly declared, "Noah oughta stuck around; he'd a seen a real flood!"

"The most immediate danger," said the skipper of one rescue boat, "was from the crevasses, rather than from the more slow-moving flood behind the levees. One levee break, for example, was at Pendleton, above Arkansas City. When it came couriers raced the lowlands, warning those who had no telephones. At noon the streets of Arkansas City were dry and dusty. By 2 o'clock mules were drowning in the main streets of that town faster than they could be unhitched from wagons. Before dark the homes and stores stood six feet deep in water."

It was so at Greenville, Mississippi. Here a crevasse at Stop Landing, above the town, sent 15,000 people scurrying to the levees. So sudden was this disaster that thousands of people huddled on the bare ground of the levees, many without food for two and three days, until aid came.

With human refugees came 18,000 head of livestock. Often mules beat men in the race to refuge. In a few hours these animals had skinned the grassy levee as clean of plant life as a plate-glass window. In their hunger they even devoured piles of empty sandbags. In a big shed near Greenville, when the levee broke, 150 mules and horses were tied to their mangers. So quickly came the flood waters that all these drowned.

"We took our launch," said a Memphis merchant who worked at life-saving for six days and nights without changing his clothes, "and went from house to house for miles over the low country, picking up survivors. At Hardin Point we found five negroes in the loft of an old barn, the building ready to collapse and float off. They had not eaten for days. When we handed them bread, they almost literally 'put their feet on it and growled.' They were too weak to stand. We lifted them into the boat. I saw lots of people, even among those on the levees, who had been without food so long they could not stand.

"As time passed, more and more rescue boats arrived. So it came that often the

LIKE A CATARACT, FLOODS RACE THROUGH CRUMBLING LEVEES

On a still night the roar of a big crevasse, like the thunder of a rushing railway train, may be heard for miles. "Over 50 years ago I first heard that dreadful roar," said an old lady who lives under the levee below Baton Rouge, "and I have never forgotten how it sounded."

same house would be searched several times in quest of survivors. To avoid this, we agreed that when a house was once searched a red flag, made of calico salvaged from a half-submerged dry-goods store, should be nailed to its gable. One house, several miles east of Greenville, had been searched and a red flag nailed to it. Yet, late one evening as a boat passed, shrill cries came from this building. The screams seemed those of a woman in terror. Cruising quickly over to it, the boatmen were amazed to see the heads of four panthers at an attic window."

RELIEF WORKERS ARE SPEEDY AND UNTIRING

At more than 70 safe, strategic points down the valley refugee camps are set up. Already the Red Cross has housed nearly 500,000 people in tents, warehouses, schools, churches, and other shelter, a number about equal to the resident population of the Nation's Capital.

Battling this unparalleled river disaster, the experienced Red Cross works at amazing speed. I saw one instance at Memphis. Word had come at 1 p. m. on a certain Sunday that a large quantity of food was urgently needed at a point down the river. Within eleven hours nine carloads had been bought, under competitive bidding; then packed, loaded, shipped down the river bank by rail, and by midnight was being loaded into skiffs and barges for delivery to famishing flood victims.

At Vicksburg the refugee camp is pitched high on green hills where long ago Grant fought Pemberton. Here, after threescore years, again long rows of tents are set up, the bugle calls, and armed sentries voice their challenge. But now, instead of the Blue and Gray, you see the Mississippi National Guard. It polices the camps, both black and white, where thousands are sheltered, fed, clothed, and doctored. Twice a day long lines form and march past the food tables (see illustration, page 262).

"I'd like to be a refugee at meal time," a National Guardsman chuckled. "They get better grub than us soldiers."

IN THIS TEMPORARY TOWN EVERYBODY LIVED ON ONE STREET—THE TOP OF THE LEVEE

Twenty-two miles upstream from Arkansas City the dike broke. Soon the whole town was inundated, and men and animals fled for life to the levee. Water rose so fast that mules drowned in the streets before they could be unhitched from vehicles (see, also, text, page 256, and illustration, page 260).

In every camp I heard grateful refugees say the Red Cross ration is ample and well chosen. Probably all the negroes and many of the whites in camp now fare better than ever. To many plantation hands a square meal has often meant merely salt pork, corn bread, molasses, and coffee.

A GOOD BREAKFAST WORKS WONDERS WITH DESPONDENT REFUGEES

Most of the refugees brought to camp wet, weak, and hungry were at first silent and despondent. Many had lost everything except the clothes on their backs. Yet, in most cases, a night's rest on a dry bunk under an Army tent, and a good breakfast, served to restore courage and good spirits. A few say they will never live under the levees again; but the majority of the farm workers and tenants with whom I talked, and they are typical of the great share of flood victims, wait anxiously for the waters to recede, so they may return.

"These valley folk never stray far from one neighborhood," an Arkansas planter said. "They may move now and then from one plantation to another, but they're all attached to a certain locality. They want to get back to their homes." He might have added, "get back to the places where their homes used to be!" For I rode the yellow flood from Arkansas down to the Passes, and I know that thousands of frame cottages that once were "Home, Sweet Home," to somebody, and all their humble furnishings, as well as family cows, pigs, poultry, and chicken coops, are now somewhere in the Gulf of Mexico.

Even the sorting out of animals and goods saved from the flood and their restoration to rightful owners will be a tangled task. As to animals, few or none are branded. Now and then one sees a cow with a scrap of paper tied to her horn, on which is scribbled an owner's name!

This rehabilitation, putting nearly half a million people back on the land and giving them houses, furniture, bedding, food, seed, implements, and animals to work with, in place of those swept away, is the huge task yet to be done.

To-day the big job is still to feed, to clothe, and to doctor. To do this the Red Cross works with local chapters all around the flooded area. It not only sends them food, clothing, bedding, and supplies, but it also extends them credit. Thus they buy locally and have their bills paid by it.

From all over America, people ship cars of food and clothing. Railroads handle this free. Texas sent a trainload of busses and autos to help move refugees from the flooding Atchafalaya Basin. Gulf towns sent scores of launches. Ford rushed carloads of lifeboats. In a spurt of generosity, one donor sent two cars of fresh fish on ice; but the Red Cross is equal to any emergency—it bought more ice and kept the fish going.

ANTIQUE HEADGEAR BRINGS SMILES TO A REFUGEE CAMP

Used clothing comes from all over the Union. In New Orleans I saw society women sorting box after box, hunting for socks and shoes that matched, rigging up outfits of children's clothes for youngsters of different sizes. From an attic in a certain Mississippi town a kindly pioneer merchant retrieved a long-forgotten cache of women's hats. They were out of date, even when the Mauve Decade was young; but they served one good purpose, anyway; they brought a lot of mirth and laughter to tired mothers in the camps. Frolicking flapper refugees even posed in this prehistoric headgear to be photographed by one of the camera-carrying army that plagued the river country.

Within reach of Natchez, Red Cross workers said, about 15,000 head of livestock were marooned on levees, mounds, and ridges. Some of the cattle got so hungry that they ate all the bark off the trees as high as they could reach. To save others, the owners built rafts, or "choctaws," as these craft are locally called, and placed them on these floats. I saw one crowded with goats and pigs, and another, a "double-decker," filled with cackling poultry. Many of the mules and cattle on the ridges lived for days on twigs, boughs, and moss.

Feeding such marooned animals is a difficult task. I saw one barge with many

"JUST TELL THEM I'M SAFE ON THE LEVEE"

Many a post office went under water during the flood, and often mails were delayed for weeks or diverted to refugee camps. When Arkansas City was inundated, people who had fled to the levees set up an air-mail box and maintained communication with the outside world by airplane (see, also, illustration, page 258).

hundreds of tons of hay fighting upstream to feed starving mules.

"My mules stood in water so long," a Greenville farmer told me, "that the shrimp got at them and ate all the skin off their legs. Animals that have stood too long in water, even if they have feed, often lie down and die afterward from the exposure. As a matter of fact, exposure killed a lot of them, and not hunger. Yet a mule, if he has water, can live several days without food."

I was told of one horse that stood two days on a small mound where there was but little feed. In a few hours he had eaten all this. But about 100 yards away, in the flood, a leafy tree lifted its waving head from the stream. Finally the hungry horse ventured into the current, swam over to this tree top, ate all the leaves from it, and then swam back to his mound.

Down the Arkansas River, in the middle of the current, came a small herd of fat steers. They were very tired. Some of them had put their chins on the backs of others to keep their noses above water. At a bridge they disap-

Photograph from Acme News Pictures

FROM THE AIR THIS MOUND LOOKS LIKE A GIANT TURTLE

In flood times, it is believed, the early Indians used such mounds as places of refuge. For decades past, whites and their livestock have fled to them during high water. This mound is near Greenville, Mississippi.

peared in a whirlpool. But two mules, harnessed together, coming downstream soon afterward, managed to get ashore.

"I'm an old 'high-water' man," one farmer said. "I never worried before about my mules; they've always swum out. A mule can swim maybe four or five hours; but not out of this flood; it's lasted too long."

One old steer, it was said, got lost in the St. Francis backwater and must have splashed around for hours. Finally, he apparently put his head between a forked limb to rest; for later, when the flood subsided, he was found hanging by the head, five or six feet from ground, choked to death. In eastern Arkansas, because of backwater and a Mississippi levee break, veritable seas were formed. One experienced steamboat captain, no longer able to recognize familiar landmarks because of high water, actually wandered away from the channel and got lost in a flooded forest with his 300-ton craft!

MUSKRATS CLIMB ON TO LIFE RAFTS

When the levee was dynamited near New Orleans, to save that city, a sea of water poured down into the parishes of St. Bernard and Plaquemines. This region is much frequented by many of Louisiana's 20,000 French and Spanish-Creole muskrat trappers. As a good trapper may earn from $3,000 to $12,000 a season, these men looked with dismay on the flood which threatened to drown out their source of income.

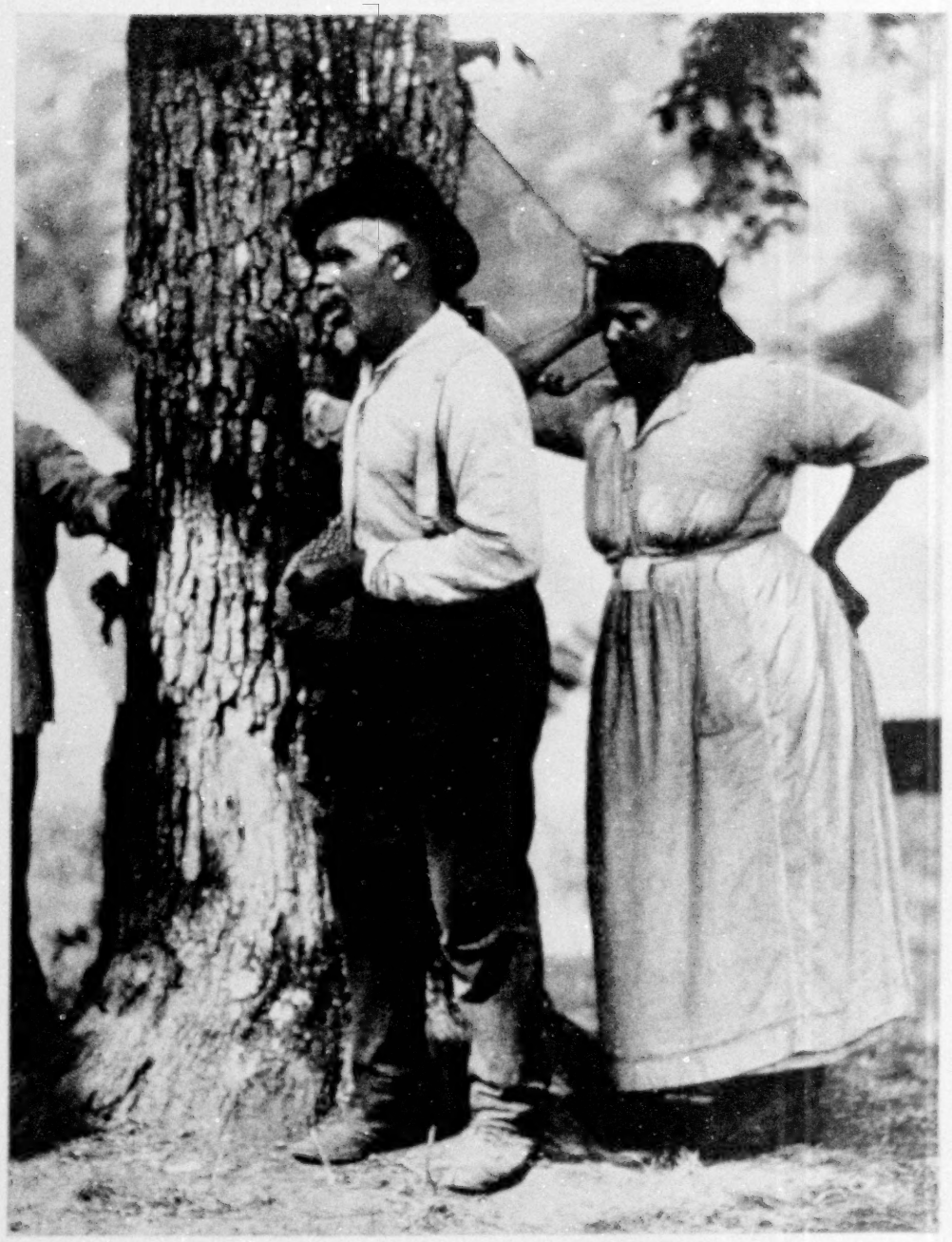
As the waters rose, thousands of muskrats climbed upon driftwood and logs, often in company with rabbits, snakes, clapper rails, and gallinules. Many of the stronger bull rats managed to exist by diving off now and then in quest of food; but, as this is the season when the

HELPFUL ALSO IN PEACE TIMES, THE U. S. ARMY SUPPLIED TENTS, BEDDING, AND CAMP STOVES

Pitched on the beautiful grounds of the Confederate Cemetery at Vicksburg, this camp was exceptionally clean and orderly. Due, perhaps, to the sobering effect of the great disaster, good order was kept all along the line by the thousands of refugees. In the foreground a mess line is forming from the cook tents (see text, page 257, and illustration, page 255).

MERMAIDS OF THE MARSHLANDS

Marie and Cecelia, daughters of the romantic land of Evangeline, were guests of the Red Cross. High water in the Atchafalaya River inundated the canefields in the "Sugar Bowl" and drove these girls from home.



SURVIVORS THROUGH MANY OF LIFE'S DISASTERS

These aged victims of yet another lowland flood have just been brought to the refugee camp and are waiting in line to be registered by the Red Cross (see text, page 265).

THE ODDS WERE THAT SHE WOULD BREAK HER NEEDLE

"I knowed when dey done gib me all dem free vittles dere was some catch to it," complained one negro as he bared his arm for compulsory vaccination. Rather than submit, some fled to the hills; but, on the whole, immunization was general. More than 500,000 people were vaccinated, inoculated, or given malarial prophylaxis (see, also, text, page 265).

young are born, it appeared that most of the females and their "kits" would perish.

Now the annual muskrat catch means a lot to Louisiana, as well as to the trappers. In a good year 6,750,000 pelts will be taken, so the State authorities set about saving the muskrat crop. Old skiffs, fish boxes, as well as about 1,500 specially built muskrat life rafts, were towed out and anchored in small fleets among the cypress, tupelo, and sweet-gum trees, and among the buttonbushes, where the rats were swimming for life (see p. 284).

Then, working with their own boats, hundreds of trappers were urged to gather swamp grass, which the rats eat, and pile it on the life rafts.

Almost immediately the muskrats responded. In a few hours from 15 or 20 to as many as 300 animals were seen on each raft.

"A significant aspect of this experiment," said a member of the Louisiana Department of Conservation, "was the reaction of the trappers. Their whole lives have been spent simply in killing musk-

rats. Yet one veteran trapper, when he got the idea of conservation, actually walked several miles at night to get some milk to save the lives of a few orphan muskrat kits which we had pulled from the flood and which tottered weakly about on the deck of our launch."

"Did this flood hurt you?" I casually asked a Louisiana levee idler. "Naw. I pick moss," said he. "Used to crop on shares. Then folks found Spanish moss was good to make beds and pillows. So I pick it. I get two cents a pound. Some weeks I earn $30. The flood ain't a pesterin' me; it's a helpin'. Water's so high now I can set in my boat and pick moss."

In an edge of the marsh we saw a rabbit, baited on a big hook, hanging a few inches above the water. "That's to catch alligators," I was told.

DANGERS OF DISEASE FOLLOW THE FLOOD

How to fight fever, smallpox, and all the dread disease that follows a vast, receding flood is the biggest of all tasks that now face the Red Cross and Public Health Service. This problem is infinitely harder, a nationally known medical officer told me, than any met in the historic clean-up of Panama. It is the most extensive health hazard ever experienced in America.

Fifty thousand dead animals must be burned or buried in flooded sections of Arkansas and Mississippi alone. Already, where waters are subsiding, people by thousands move back to see what condition their homes are in. Here drinking water is contaminated. Whole villages, soaked for weeks under water, reek with decaying plant and animal life. Flowing water gives way now to stagnant pools, strewn with floating things black with flies. Mosquitoes breed by billions.

Now, medical men say, only the most rigid precautions, the strictest adherence to health and sanitation principles, can avoid appalling loss of life in the months ahead.

Already hundreds of thousands have been immunized by inoculation and vaccination. Millions of doses of quinine have been passed out. Tons and tons of lime for disinfection have been shipped to towns now emerging from flood, and many a carload yet must go.

Safe water, safe milk, universal typhoid inoculation, and mosquito control, malaria prophylaxis, disposal of dead animals and garbage, ample medical service to save now from disease men already saved from floods—that's the job of the Red Cross, the U. S. Public Health Service, the various State and county medical boards, and a host of picked medical men from all over America.

THE SPADE SUPPLANTS THE BANJO ON THE LEVEES IN FLOOD TIMES

Moonlit nights, banjos, the strains of "Old Black Joe"; ragged groups of lazy, happy blacks prone on cotton bales, singing melodiously of that famous old race between the steamer *Natchez* and the *Robert E. Lee;* crap games, possum meat, buck and wing dances—all these, in the popular mind, are a part of picturesque levee life.

But not in flood times. Now the spade is above the banjo. Pastimes are forgotten. On the levees, fighting now to save their homes and their lives, white men and negroes work side by side, topping the levees with sandbags, pushing wheelbarrow loads of dirt, building tight board fences inside the levee crown to keep lapping waves from breaking over. Few words are said; everyone knows what to do. Men work, actually, till they drop in their tracks. They keep the water back, if they're lucky. Often, after days of toil, the water wins; then tired men drop their spades, their barrows, and bags and flee for life (see, also, page 268).

Sometimes they do not run fast enough. Levee workers drowned in the break at Stop Landing. Convicts from the prison gangs help here and there. I saw hundreds in line below Baton Rouge. All about them, as they worked, stood men holding shotguns; and there were bloodhounds. And only the day before, a guard told me, there had been work for the hounds. In three weeks down here the only songs I've heard have been camp-meeting hymns in the refugee camps—hymns like "Throw Out the Life Line" and "Shall We Gather at the River?"

As we drove along under the levee above New Orleans, then hourly expected

FLIVVERS RODE AT ANCHOR IN THIS IMITATION VENICE

Water flowed so swiftly through the streets of Greenville, Mississippi, that it took a rescue boat four hours to make a mile against the current. Here thousands of people fled to the levees, seen in the foreground; many were without food or shelter for more than 48 hours, until relief came from Memphis (see, also, text, page 256).

to break, we saw men carrying shotguns, patrolling its top. They warned us to keep off. We did not have to be told twice. The editor of a southern newspaper told me his "press boat" was fired on more than twenty times in one week, when it cruised too near levees, as reporters went scouting for flood news. The wake from a passing boat may easily push water over the top of a levee and start a break.

HOW A FLOOD COMES DOWN THE VALLEY

Now and then, too, cranks cut a levee; or men, moved by selfish or sinister aims, come with a spade or a stick of dynamite to start a trickle that soon becomes a torrent. Hence the guards with shotguns, and a rule of safe and sane levee manners is to shout your name and business quickly when you see a man coming with a gun.

The march of a big flood down the Mississippi Valley is not in the form of a big tidal wave, nor even as a rapid, roaring stream that makes a wreck of every house it hits. If the Mississippi behaved as does the Colorado or the Columbia at high-water stage, it could not be that thousands in its flooded valley now sit safely in the second stories of their houses, being fed by Red Cross relief boats, waiting for waters to recede.

A Mississippi flood below Cairo is curiously deliberate and leisurely. Sometimes the crest of the stream, within the levees, makes from 30 to 50 miles a day. Sometimes it travels not more than 10 or

Photograph Courtesy U. S. Coast Guard

SUBMARINE RAILROADING

These surfboats are part of a fleet of twenty which, with their crews, was shipped by train from U. S. Coast Guard stations along the New Jersey and Delaware coasts to Natchez, Mississippi. Weeks ahead of time, because of warnings from the U. S. Weather Bureau, it was known just when rising flood waters would strike and inundate a given community.

15 miles. Again, the river may rise to a certain high point, then fall somewhat; then rise even higher. Occasionally, therefore, the exact location of the flood crest is temporarily lost. Such is the big river's whim.

SOMETIMES THE MISSISSIPPI'S TRIBUTARIES FLOW BACKWARD

In theory, this "Great American Sewer" is a high-water trough that stretches 1,000 miles, straight from Cairo to the Passes below New Orleans; but actually the crooked walls of the big trough are cut in many places by the mouths of other streams that empty into it. These tributaries, too, such as the Arkansas, the Red, the Black, White, and St. Francis, are diked for varying distances upstream from their mouths. As long as their waters are high enough, they flow into the Mississippi; but if the latter stream happens to be the higher, it turns part of its waters into the mouths of these tributaries, producing backwater. In turn, if this backwater gets high enough, it breaks over the banks and levees of these tributaries. This happened in 1927.

As I write this, a vast sheet of water as yellow as the China Sea at the mouth of the Yangtze, stretches practically from southeast Missouri down to the Atchafalaya Basin of Louisiana. This sea is about 1,050 miles long and in places over

BLOODHOUNDS PLAYED THEIR PART IN THE FIGHT AGAINST FLOODS

DAY AND NIGHT WEARY MEN FOUGHT THE MAD RIVER

Windy days are extrahazardous in high-water times along the lower river, for then lapping waves bite at the levee top. Unless promptly checked, any tiny break may soon become a roaring crevasse. To avert this, a tight board fence is often built at the river's edge and banked behind with dirt.

Photograph by Stanley Clisby Arthur

NECESSITY AND FEAR MAKE ALL LIVING THINGS AKIN

FLOODS TAKE HEAVY TOLL OF WILD LIFE

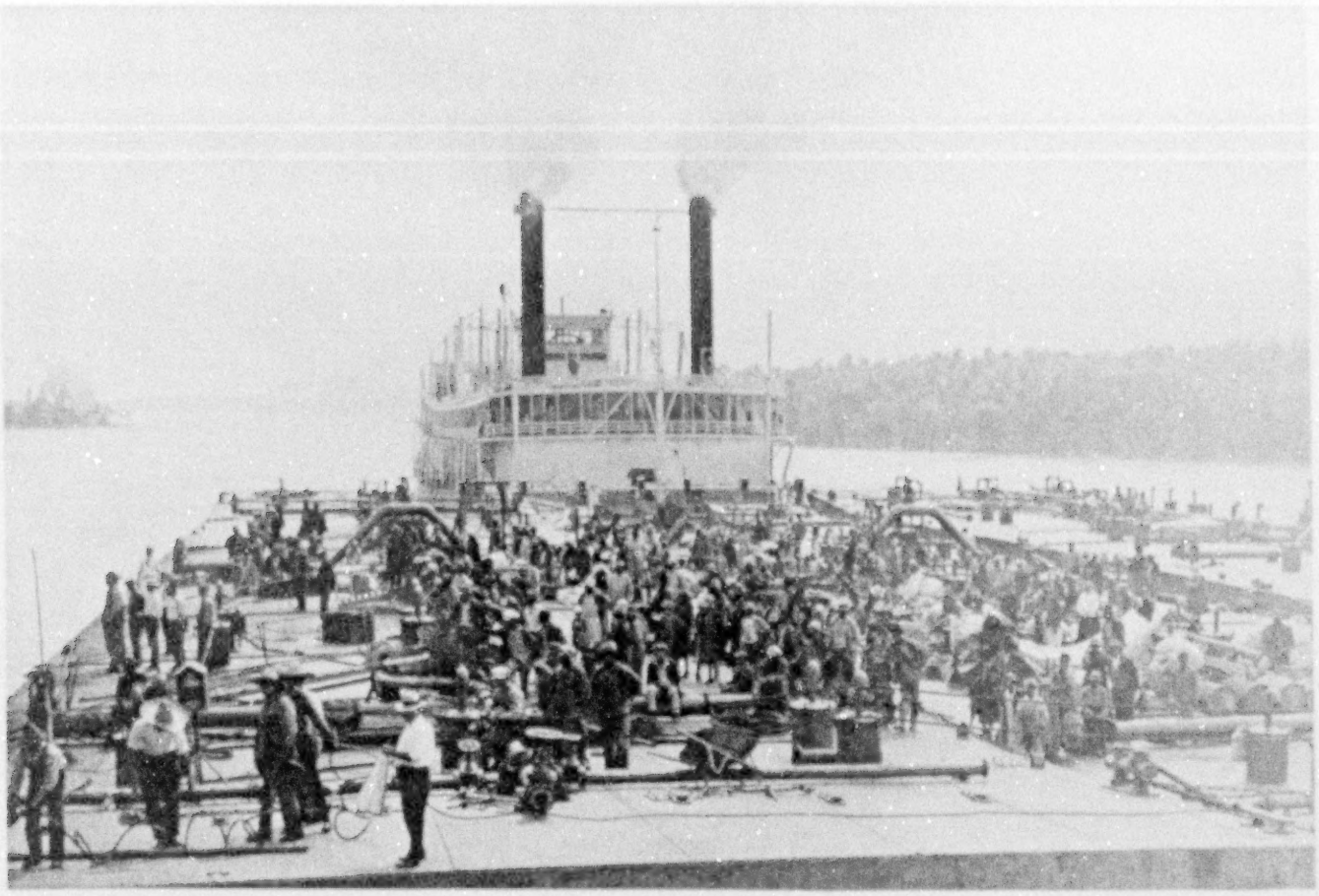
Caught by the rising waters, wild creatures of the lowlands, such as deer, rabbits, turkey, and quail, fled to the levees and unafraid mingled with domestic animals. Men protected them. Only the snake was denied refuge (see, also, text, page 248). This tired doe, in obvious distress, was roped and helped ashore.

A TINY TRICKLE OVER A LEVEE MAY GROW TO A RAGING TORRENT

Dynamite was used to make this small break in the levee at a point about twelve miles below New Orleans. Later, other charges were fired to widen it, in order to increase the volume of the flood pouring through and thus relieve pressure on the levee at New Orleans.

USING LONG-HANDLED POST-HOLE DIGGERS TO PLANT DYNAMITE

To widen the Poydras crevasse below New Orleans, and thus relieve the overloaded Mississippi, another section of levee was blown out at this point. A few minutes after the photograph was taken, 1,500 pounds of explosive were fired, blowing hundreds of tons of dirt high into the air (see, also, illustration, page 251).



RESCUE BOATS WERE RUN LIKE AN ARMY TRANSPORT FLEET

Pushing their big barges, light-draft stern-wheelers moved from town to town in the yellow sea, or from one marooned group to another, loading and hauling people, furniture, and livestock to safety.

Photographs Courtesy American Red Cross

RUSHING BOAT BUILDING IN ADVANCE OF THE COMING FLOOD

Although nearly every family along the lower Mississippi Valley owned some kind of boat, so unprecedented was the 1927 flood that many more craft had to be quickly built. The boat-building scene in this Louisiana lumberyard was reenacted in many other places, under Red Cross guidance (see, also, illustration, page 274).

NO COAXING WAS NEEDED TO MAKE THESE BOYS "COME AND GET IT"

50 miles in width. Over 750,000 people normally live within its limits. Flying over it now in an airplane, you see the roofs of their houses, the smokestacks of their sawmills, their church steeples, the tops of their shade trees, and lines of telegraph poles sticking up from the water. From high in the air, too, you see railway embankments etched sharply against the yellow background of water, and you know that all railways are not really built as straight as they look on the folders.

So, despite the incredible volume of water flowing down the valley, it usually travels slowly, because it is so broadly spread out. In fact, it took this inland sea which has formed west of the Mississippi's west dike about five weeks to push its way through forests, fields, over railway embankments, and local levee systems from southeast Missouri down into Louisiana. There the levees broke at Bayou des Glaises, above the great Atchafalaya Basin, flooding the Acadian land of Evangeline.

Of course, when the main levee of the Mississippi River breaks a widening stream rushes through at terrific speed. One saw this in the break at Stop Landing, above Greenville. There the escaping water poured through the crevasse it made in the levee, then broke through the local protecting levee on the north side of Greenville, and swept the streets of that city at fifteen miles an hour.

So it is these breaks in the main levees, rather than the slow-moving inland sea formed from backwater, that most imperil the lives of lowland dwellers.

From the slow-moving flood *behind* the levees, most people could readily escape, by starting in time. A typical example of this occurred near Marianna, Arkansas. When flood waters began to appear in the bottom lands near there, residents of the city, having been warned that the flood would be a bad one, had already made plans to rescue their country neighbors of the bottom lands.

Barges and power boats were requisitioned, tents and cots ordered, food supplies laid in, and committees named to handle different phases of rescue work. By this timely, systematic effort, about 6,000 people were safely removed from the lowlands. Not a human being was lost and even practically all the livestock was saved. This, in general, was the res-

COAST GUARD CRAFT ON THE RIVER FRONT AT NATCHEZ

In the vast life-saving fleet hastily mobilized and directed by the Red Cross, more than 1,000 vessels and boats were drafted into service. Often all the people in a village, sometimes even the entire population of a county, had to flee from rising waters.

cue method which, followed out on a big scale, saved tens of thousands of lives all down the valley.

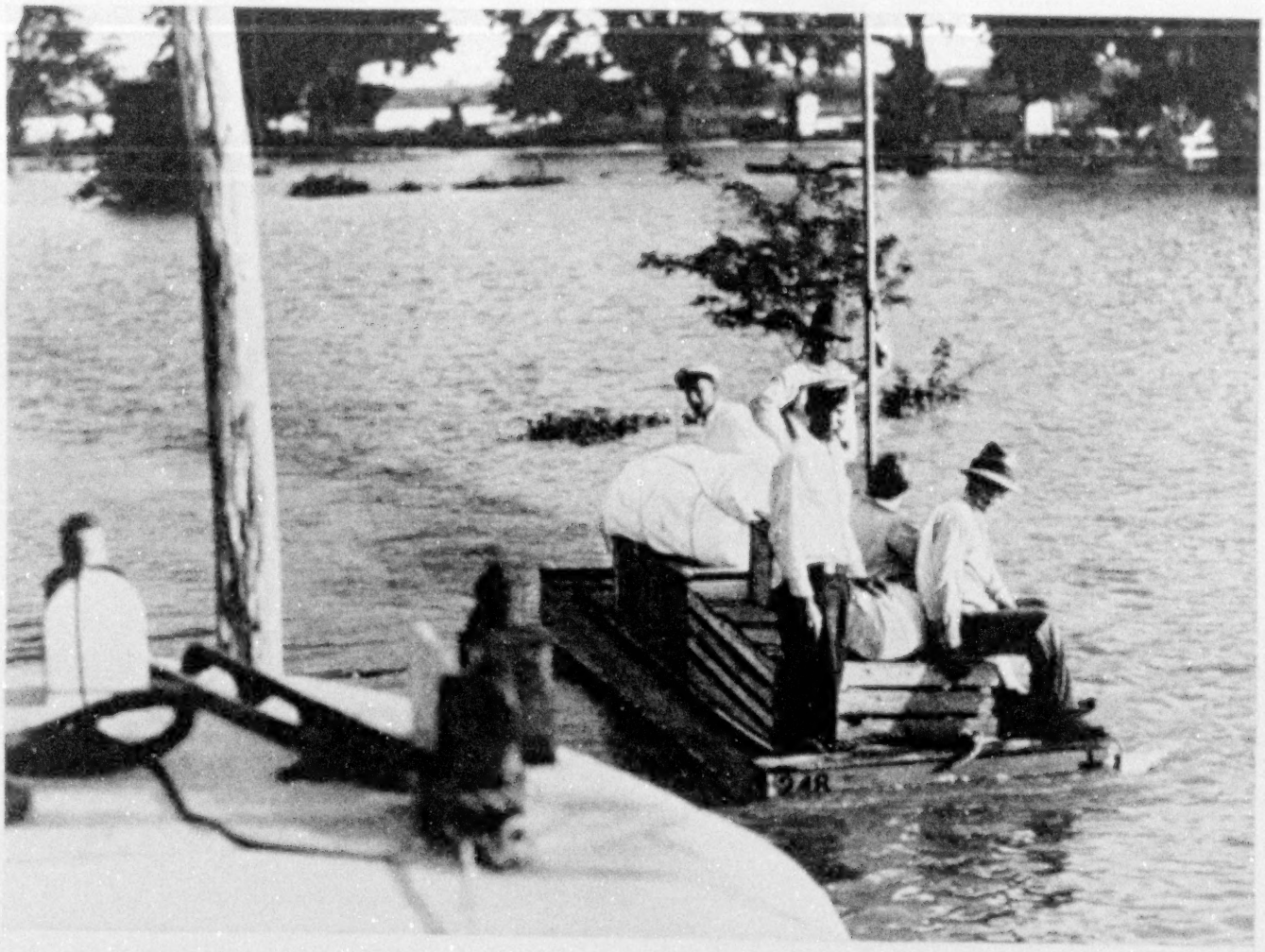
"Special flood bulletins," issued by meteorologists of the Weather Bureau, kept the whole Mississippi Valley informed of probable high-water stages at different points. With these warnings before them, those who believed could save themselves.

THE FLOOD PRODUCED MANY AN UNSUNG HERO

True tales of heroism, of privation and fortitude, come to the Red Cross almost daily. I heard one story of a young woman, a nurse, who went alone at night, in a small power boat, to save two refugees afloat on a raft far out in the dark flood.

When the roaring rapids broke through the Bayou des Glaises crevasse, crews of the U. S. Coast Guard fleet, driving their powerful surfboats through the tumbling torrents, took from the crumbling levees and swaying housetops over 1,200 men, women, and children. "With their small white caps perched at jaunty angles," said a news dispatch, "and wearing sleeveless jerseys and dungarees, the guardsmen, stripped for action, accepted every challenge offered in the task of rescue. Time and again the surfboats careened dizzily through the narrow gaps to reach refugees in a hurry. But they did the job. Every life was saved, the Coast Guardsmen having met the severest rescue test of the flood and succeeded gloriously."

And here again, at Bayou des Glaises, Naval and Marine aviators, flying for six to eight hours without a stop, where any forced landing amid floating wreckage and tree tops would have meant disaster, circled far and wide over the tumbling inland sea, seeking marooned groups of people whom only the hard-working sailors could save (see, also, page 250).



THE SKIPPER OF THIS FLATBOAT IS A DEEP-WATER MAN

From the U. S. Navy lifeboat anchored to the telephone pole (left), the sailorman with the pipe went in his flatboat to the flooded farmhouse seen in the background. There he rescued a farmer and his wife, together with two crates of chickens. The Red Cross built many of these cypress square-end flatboats, equipped for outboard motors. They were easily shipped from place to place, where danger threatened (see, also, illustration, page 271).

For sixteen consecutive hours one young Tennessee doctor waded in the mud and water at Greenville administering typhoid inoculations.

In contrast with the heroic and the tragic events of the flood, one now and then hears a tale in lighter vein. When the water rose into a jail in Tensas Parish, Louisiana, all prisoners were removed to Natchez. Then, into the higher, drier cells, not reached by water, a number of local citizens moved and remained during the flood.

CONSISTENCY WAS NOT HIS VIRTUE

I saw one tired volunteer; all day he had worked, nailing up health placards. These printed posters warned people not to drink the flood water. When he had nailed up the last one he mopped his perspiring brow, walked to the levee's edge, lay down, and took a long drink of river water!

Into Red Cross headquarters at Memphis came a report from Arkansas that a small band of pious negroes there, led by their pastor, had actually built a rude ark. Into it they put their wives, children, chickens, dogs, and pigs. But the ark began to leak, and the would-be Noah hastily fled to the levee, his disciples and their animals wading "two by two" swiftly after him.

From Ferriday, Louisiana, came a story from the telephone exchange. As the water rose, the switchboard was moved to a high platform. Then a strange, large fish, supposed to have been a porpoise that had found its way up from the Gulf, swam into the exchange office and blew such a stream of water over the switchboard as to render it useless. The same operator declared that in the 1922 flood she had to keep a club on her switchboard table to fight off the snakes that tried to crawl upon it.

HOW THE SUBMERGED HALF LIVED

Uprooted by high water, humble homes gave up their secrets of shabbiness and poverty. Often the meager earthly goods of a large family could be loaded in one end of a skiff. These trucks have just met a rescue boat and are hauling flood victims and their effects out to camp. The homes of at least 500,000 people, a population equal to that of the National Capital, were either wholly or partly flooded.

One man we saw sitting calmly in the attic of his house, which he had lashed to a tree with ropes. He had food and refused to leave his perch. "Throw me a hawser," he said, "and tow my house back up this bayou a mile, where it floated from." We saw many small houses tied to trees with rope and wire.

MANY OWE LIVES TO RAILWAY TRAIN CREWS

Perhaps in all the annals of American railroading, trains never operated under such singular conditions as during this flood. Although over 3,000 miles of track were submerged and scores of bridges washed out, in many places trains were actually run through two and even three feet of water to haul out people and livestock. Once I saw a brakeman ride on the cowcatcher, pole in hand, to shove drifting logs, fences, or shanties from the front of the engine (see pp. 247, 267).

Literally thousands of refugees owe their lives to the courage and fortitude of the train crews. Although such trains, running over submerged tracks, crept slowly along, it was impossible to know whether the water-soaked roadbed would support the heavy engine. The crew simply took a chance. Refugees rode out in flat cars, or in and on top of box cars, with all their bundles, babies, dogs, and chickens, for all the world like a Mexican army in transit. Into one box car an excited refugee locked 28 head of cattle. When the relief train drew in, all the cattle had smothered to death.

I saw many freight cars standing or lying on their sides in the floods, from Little Rock down to Baton Rouge. One freight car bore in big letters this striking sign: "Extra airplane parts. Rush to Mississippi Flood District." At Little Rock a trainload of stone was put on a steel bridge to hold it steady. It held the

MUTUAL PERIL MAKES ODD PLAYMATES

"I don't know where they came from," said little Mary, in the refugee camp at Vicksburg. "When I woke up yesterday morning, five little possums were in my tent. Yes, the others all got away."

THE IMPROVISED WASHTUBS KNEW NO UNION HOURS

"Somebody has to do this; it might as well be we," they said. The real spirit of the American people glows brightly in hours of stress and even flood sufferers can smile.

bridge awhile; then vibration set in, and the bridge, train and all, plunged into the flood.

Before railways covered our land the Mississippi and its navigable branches formed the only highway net for traffic throughout its big basin. Its system includes about 20,000 miles of "moving roads" on which boats can ply a part or all of the year.

FLOOD CONTROL AND NAVIGATION

As midwest population grew denser and railways multiplied, river traffic, for various reasons, fell off. Gradually the famous old packets passed from service. By the time of the Spanish-American War river-borne traffic, which had played so big a rôle in the Civil War, had fallen to low ebb.

However, during our car shortage of the World War, America began again to be "river-minded." She beheld with interest the astonishing amount of inland freight carried at low rates on rivers in Germany and elsewhere. She began to see that, to achieve the utmost economic development of her own inland regions, she should make better use of her rivers in moving goods more cheaply down to sea.

Now this new policy slowly takes shape. Few people realize that to-day the Mississippi carries twice as much freight as in the halycon ante-bellum years, when over 1,000 vessels plied its waters. As I write this, one steamer and her barges from Pittsburgh is just passing Memphis en route to New Orleans with 14,000 tons of coal. Another barge tow brought to Memphis enough steel to load ten freight trains. Yet the average packet of earlier days carried not more than 200 tons of freight. In other words, it would have taken 50 to 75 old-time packets to carry what one modern steel tow can haul.

In and around Pittsburgh great steel corporations own their own tugs and barges. Down the Monongahela and Allegheny they bring coal to their plants, and from Pittsburgh down the Ohio and Mississippi they ship their structural steel and other products. Much iron pipe for the Oklahoma and Texas oil fields is brought out this way and hauled from New Orleans on sea barges to the railhead at Houston and Beaumont.

On the lower river much crude oil is handled. This traffic will be taken through the intercoastal canal from Louisiana to Texas when that great artificial waterway is completed. On their return to Pittsburgh these barges carry sulphur, fluorspar, and other bulky things needed around Pittsburgh.

The Government-owned Mississippi-Warrior barge service was established, not as an experiment, but simply to demonstrate to shippers that a properly organized and well-operated barge service could be run successfully as a common carrier, providing it could obtain joint river and rail rates. Already this service, from St. Louis to New Orleans and from Birmingham to the Gulf, has saved millions of dollars in freights, not only on downstream autos, grain, cotton, etc., but on upstream coffee, sugar, bauxite ore, and other imports.

But without the work done by Army engineers in building navigation dams and locks in the Ohio, and in dredging, revetting, and regulating the Mississippi channel and freeing it of snags, these big barge tows could not run.

THE DAYS OF HEAVY PASSENGER TRAFFIC ON THE RIVERS ARE PAST

Long passenger hauls on the rivers can, of course, never be restored. Boats are too slow. Only between near-by river points like Cincinnati and Louisville, where a convenient overnight run is afforded, can river-borne passenger traffic be profitable.

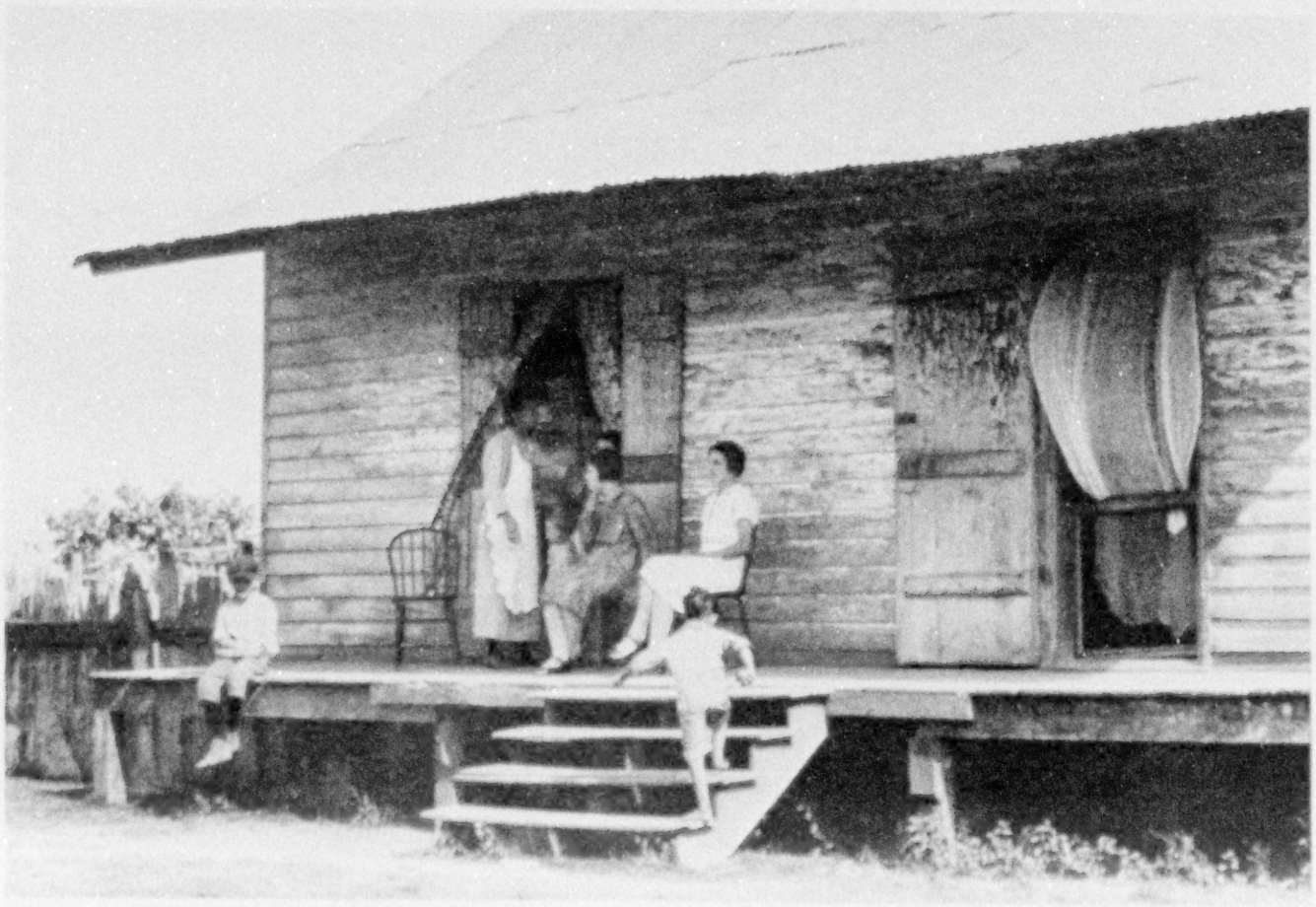
But the freight trade, especially in bulky commodities like lumber, coal, building materials, grain, cotton, ores, and similar products, which can be moved in a leisurely manner, will undoubtedly grow just as fast as improved navigation will permit. Already the single item of crude oil, barged from Grand Lake, Arkansas, to the refinery at Baton Rouge, has reached 3,000,000 tons a year. One lone barge tow carried 224,000 barrels of oil, equal to 25 trainloads of 40 cars each.

You can see how much flood-control means to America when you recall that fully 85 per cent of all basic products which enter into her foreign and domestic commerce originate in that vast Missis-

Photograph Courtesy U. S. Coast Guard

THE COAST GUARD TURNS ITS LIFEBOAT INTO A FURNITURE VAN

From the Atlantic coast, from Gulf ports, and even from the Great Lakes, lifeboats and small power craft of various types were rushed to the flood area, often by special train. Here a Coast Guard boat is saving household goods near Cairo, Illinois.

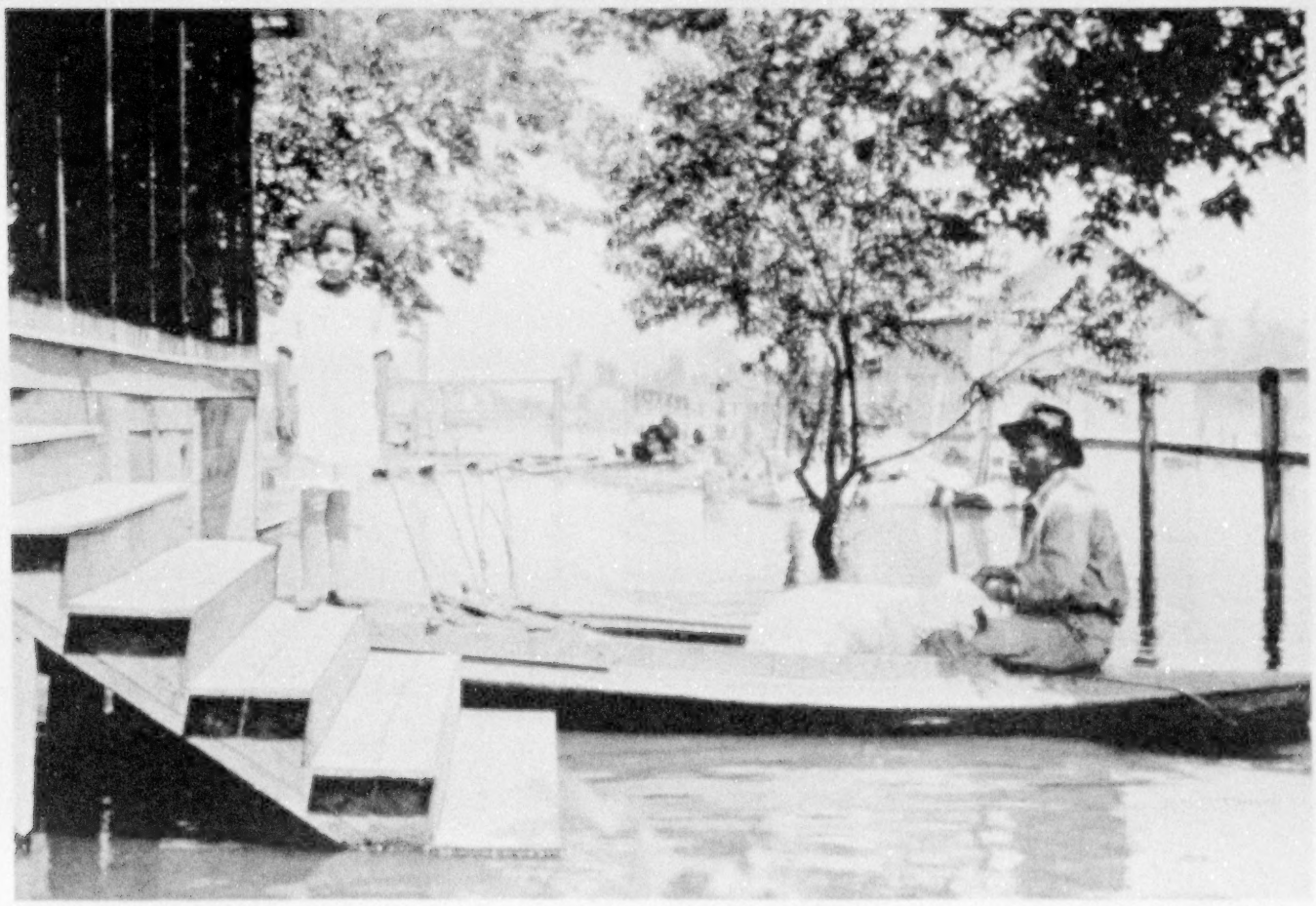


MANY LIGHT FRAME HOUSES SUCH AS THIS FLOATED AWAY

Small houses were often tied to trees with wire or ropes to hold them fast. But scores of others, moved by winds or currents, left their foundations, sometimes lodging miles away against trees, levees, or railway embankments.

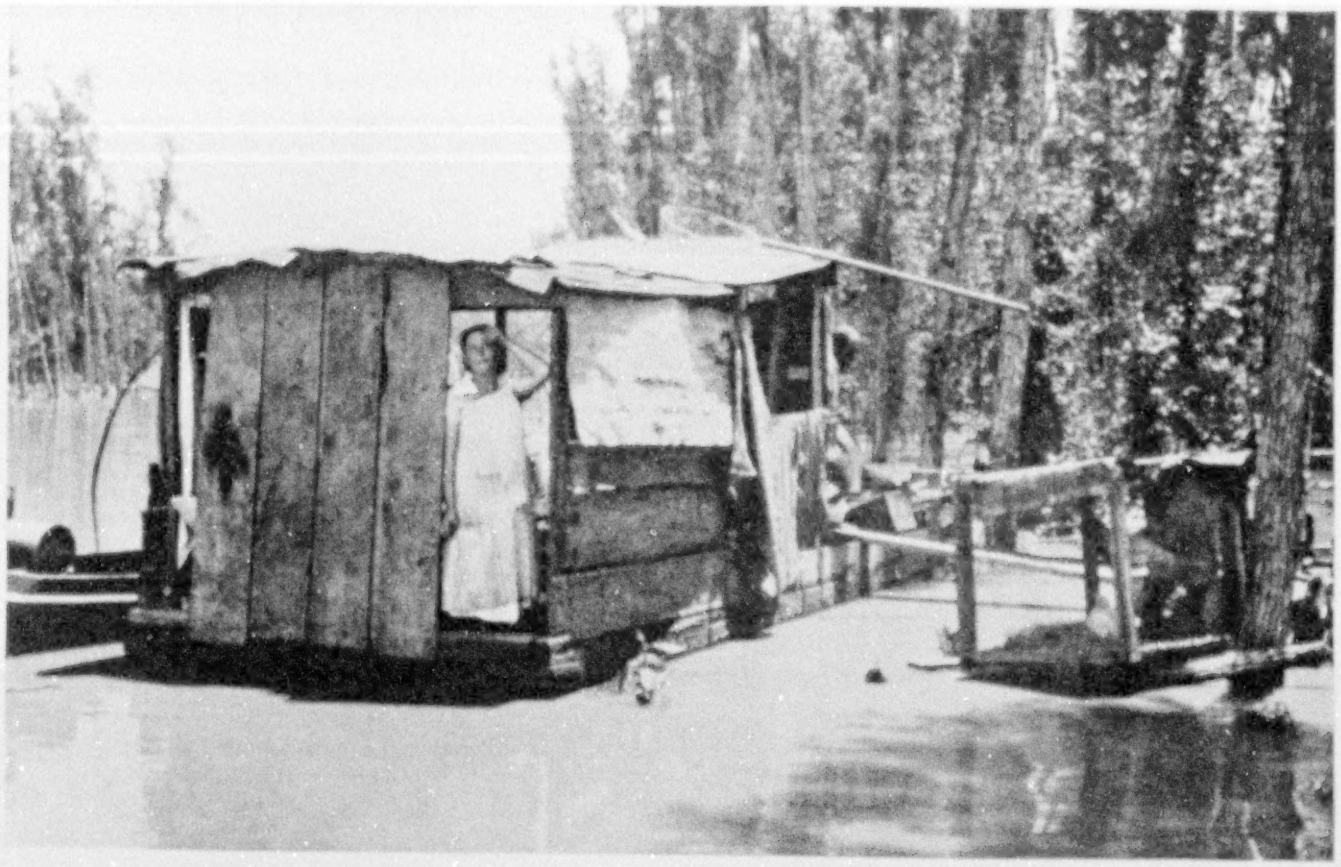
ONE DIDN'T HAVE TO "GO" FISHING—ONE SIMPLY FISHED

During the high water the sight of women and children fishing from levees, half-flooded houses, or barn lofts was a common one, but it was most uncommon to see any of them catch a big fish.



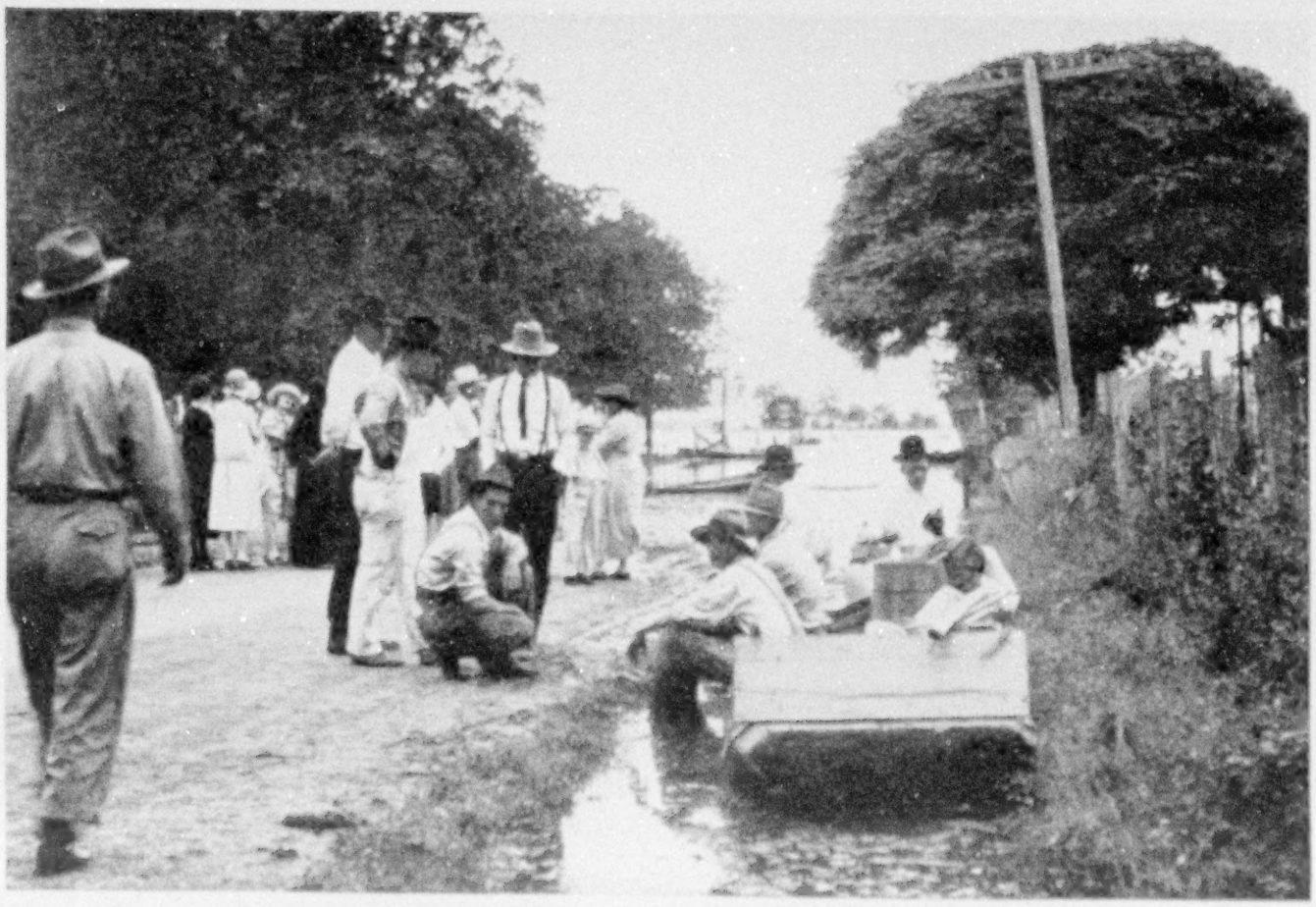
MANY PEOPLE REFUSED TO LEAVE THEIR HALF-FLOODED HOMES

Relief boats made regular trips, carrying food and other supplies to many flood victims marooned in their water-bound houses. Note the chickens, also marooned on the woodpile in the back yard.



ONE OF THE MANY FLIMSY "ARKS" THAT RODE OUT THE FLOOD

Often lowland dwellers who owned shanty boats remained in them rather than go to the refugee camps. This primitive craft is anchored to the trees in a small bayou near New Iberia, Louisiana.



MIGRATING ACADIANS USED MOTORBOATS AND FLIVVERS

Descendants of French families who were deported from Nova Scotia in 1755, these Acadians, or "Cajuns," of the Bayou Teche country in Louisiana, are again driven to exile, this time by high water.

sippi Basin, bounded by the Appalachians, the Rockies, Canada, and the Gulf.

Here is produced 80.8 per cent of all the wheat yield in the United States; 86.9 per cent of all the corn; 97 per cent of all the iron ore; 95.8 per cent of the coal; 82 per cent of all farm implements; 61.6 per cent of the cotton; 52.9 per cent of the lumber; 74.8 per cent of the livestock; 97.5 per cent of the sulphur; 66.4 per cent of the salt; 70.8 per cent of the oil, and a huge share of clothing, shoes, groceries, hardware, automobiles, and many other things.

From New Orleans navigable waterways radiate to Pittsburgh, to St. Paul and Minneapolis, and to Kansas City. Soon a canal will be open from Chicago to the Mississippi; and the great intercoastal barge canal, now being built, will carry cargo by water from Pensacola to Brownsville, crossing the Mississippi at New Orleans.

LEVEES ARE EXPENSIVE BUT NECESSARY ITEMS

Since the French built the first levee at New Orleans in 1717, it is said close to $230,000,000 has been spent on them. This seems a huge sum. Yet, when you see how great a share of all America's produce comes from this big basin, and when you remember that the total cost of levees has been spread over many generations, it is seen that, after all, this annual charge is merely a necessary insurance against floods.

Most of us think of levees as built only to hold back floods, and that thus their benefits are purely local.

"But," says Mr. Hoover, "the disasters accruing from an insufficient flood protection of the valley of the Mississippi are not local in effect, but react on the producers, consumers, manufacturers, distributors, and investors in all parts of the country."

Also, were it not for levees, we could hardly navigate the river at all from Cairo to the Gulf, especially during low-water stages.

Hence, "improvement of the Mississippi" means not only guarding the lives and homes of people under the levees, but also providing low-cost water transport for the whole Middle West.

Congress in 1879 created the Mississippi River Commission. It sits at St. Louis. It is made up of Army engineers and civilians. Its job is to control the river, as best it can. Each year Congress votes funds for its use.

Also, from Cape Girardeau down to New Orleans, taxpayers along the river are grouped into local levee boards. There are 28 of these. They are affiliated, with a head office at Memphis. Their union is called the Mississippi Flood Control Association. It seeks to work in harmony with the official Mississippi River Commission.

Each levee district has its local problem. But it is the River Commission which decides when, where, and how levee work shall be done. For each $2 spent by the Federal Government in any district the local levee board must spend $1. Because local boards have sometimes failed to raise their dollar, needed work has been left undone. Hence, as a levee is like a chain, the whole being no stronger than its weakest part, the levee system as a whole is defective.

Many years' experience with this piecemeal levee work has proved, valley dwellers say, that such policy is unsound; also, throughout the Nation, sentiment grows that, once for all, the United States should make a thorough study of the vagaries of its greatest river and seek some uniform unit method for checking the growing flood loss.

PLANS ARE AFOOT TO REDUCE FLOOD MENACE

"The problem in the past," said a joint statement issued at Memphis by Secretary Hoover and Maj. Gen. Edgar Jadwin, Chief of Engineers, U. S. Army, "has been to raise funds to get the levees above the record stages of previous floods. It should now be recognized that we must aim higher. The levees should now be raised to insure the protection of the lands against such a flood as is now passing, with a margin of safety, to provide for such greater flood as the experience of the past, combined with reasonable predictions for the future, may indicate.

"This work will cost millions of dollars. It is largely a national work, more so than has heretofore been conceived, for

FREE BEANS FOR THE FLOOD FIGHTERS

the reason that the raising of the levees in one part of the river inevitably brings greater flood hazard to those below, and the work throughout the many States must be prosecuted as one complete and coördinate whole.

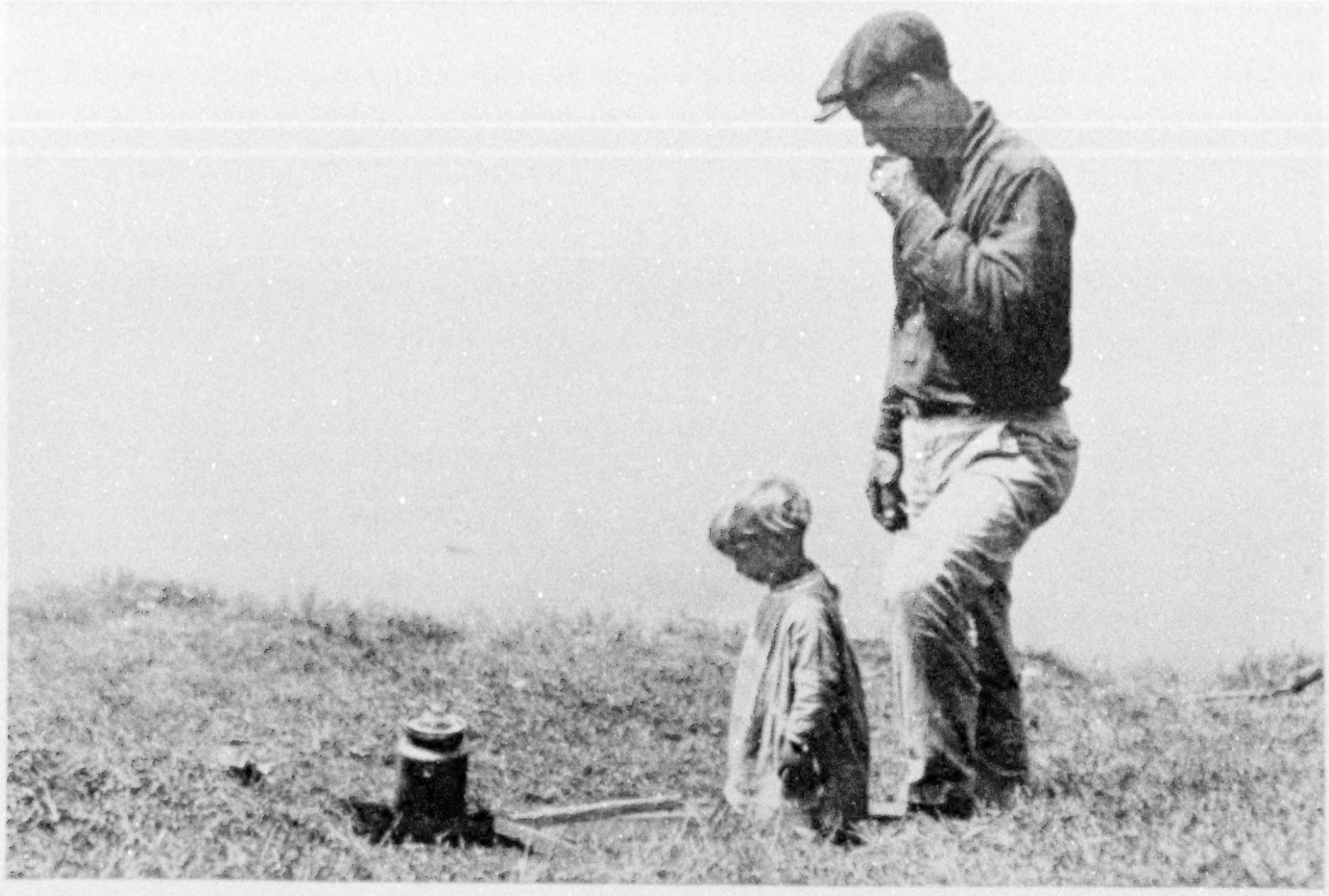
"Levees are the practicable, feasible, and economical means for affording flood protection for the valley as a whole. They will, if raised to a coördinate height, do it as effectively for New Orleans and Louisiana as for the upriver States.

LEVEES ARE PRACTICABLE, FEASIBLE AND ECONOMICAL

"There are special reasons, however, why consideration should be given to permitting New Orleans to keep her levees at a lower grade if adequate flood relief can still be afforded lower Louisiana. This involves a study of the possibilities in the way of construction of spillways by which the least productive portions of Louisiana would be dedicated to the escape of flood waters overland, by a shorter and quicker route to the sea, thus relieving the burden to be carried by the main channel.

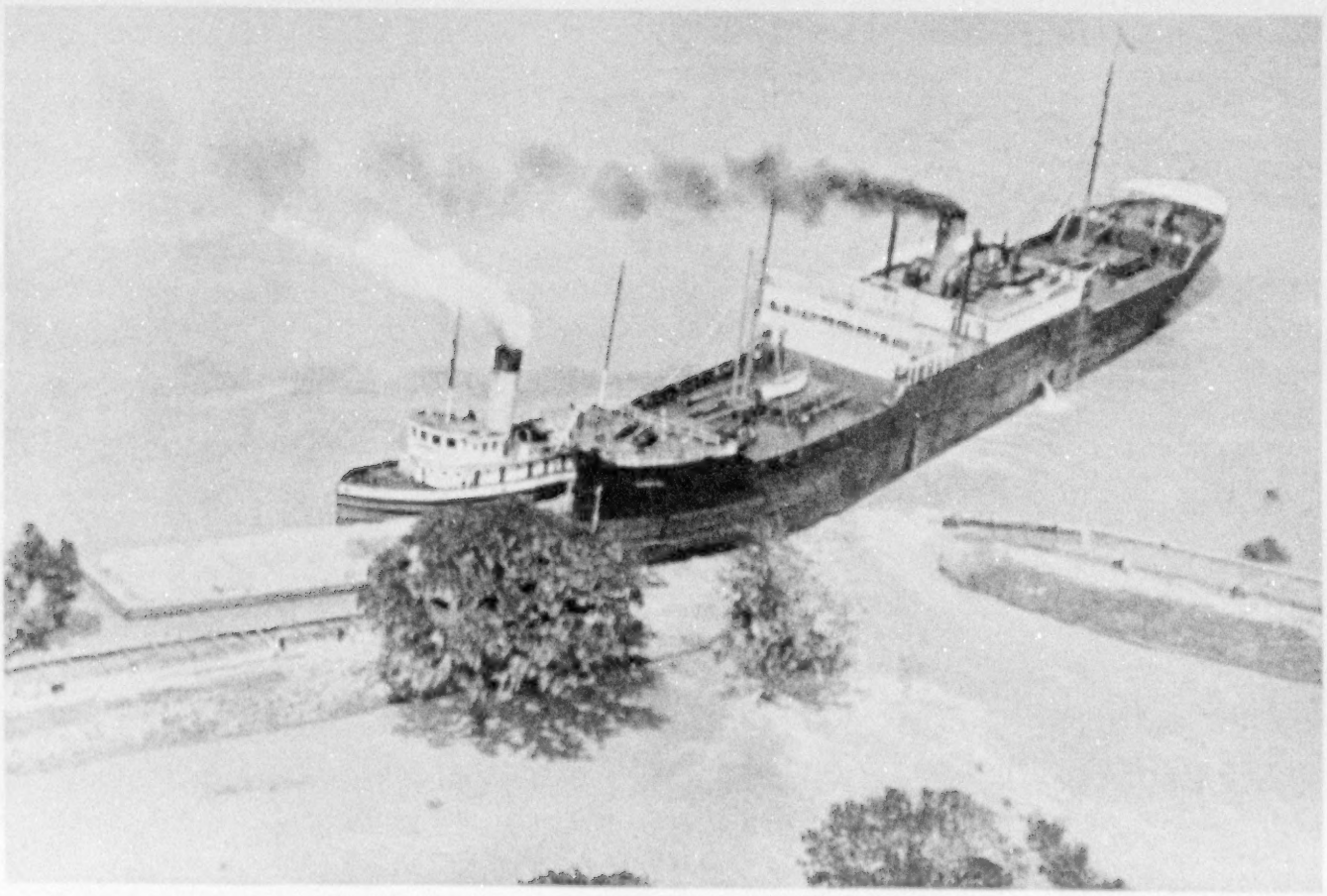
"The City of New Orleans, one of the vital commercial centers of the United States, containing the largest concentration of human beings and their property below St. Louis, is located in the lower valley. While it is possible to afford as good protection by levees to this city as to the rest of the valley, the cost and engineering considerations of raising its wharves, adjusting rail communications, and otherwise revamping the port facilities to meet an increased levee height would be great and must be compared with the cost and engineering considerations of spillways. Under the authority of Congress, a board of Army engineers has been for a year in coöperation with the Mississippi River Commission and is now making the necessary observations and computations for studying this question and expects to have a report ready for the next session of Congress.

"It is essential that at this time, when the need for rehabilitating the overflowed regions and of fully safeguarding the remainder of the valley is most urgent, time and money be not wasted in the consideration of visionary measures of relief. It is our mature judgment that the feasible means of guarding against



WHY DOESN'T THAT COFFEE BOIL!

With amazing speed and efficiency, Red Cross workers sought out hungry groups of marooned refugees, giving them aid and comfort with food, drink, medicines, and shelter (see text, page 257).



Photograph from Wide World

THE MISSISSIPPI CURRENT OFTEN PLAYS ODD PRANKS

This steamer, swung crosswise to the stream by a giant whirl in the current, stuck its nose into the levee near Junior Plantations, Louisiana. Through this gap water poured, flooding several square miles of farm lands (see, also, text, page 285).

Photograph by Stanley Clisby Arthur

A TIRED MUSKRAT RESTING IN A HALF-SUBMERGED BUSH

FROM MUSKRAT PELTS COMES SOME OF THE "HUDSON SEAL" OF COMMERCE

Rising waters flooded vast swamp areas in the Mississippi Delta, where French and Spanish Creole trappers take millions of pelts each season (see text, page 264).

future flood disasters in the lower Mississippi is the adequate widening and raising of the levees on the main river and its backwater tributaries and the extensions of bank protection, with the possibility of special treatment in special situations in the lower valley."

THE GREAT RIVER HAS CERTAIN WELL-DEFINED HABITS

To see better why these levees break, let us look at the habits of this big river before white men came and tried to confine it between high, artificial banks.

Countless centuries ago it began building a vast alluvial plain from silt brought down. In every 1,000 cubic feet of water, it is estimated, the Mississippi carries 42 pounds of mud. In a single year it pours into the sea about a cubic mile of silt. This is the soil wash from 41 per cent of the whole United States, or the equivalent of three inches of rich earth from off about 13,000,000 acres of land.

Before men tried to confine it, the lower river overflowed each year, depositing its silt along its sides. High land thus built sloped gradually away from the stream, so that its waste water ran off to swamp stretches which paralleled it some distance back. Most of the earlier plantations along the lower river fronted on its banks and ran back toward these swamp catchment basins, which were Nature's reservoirs for flood water.

Then puny man began throwing up his levees. He tried to take a stream that used to be many miles wide at flood time and hold it in a narrow channel between high dirt banks; also, to recover natural swamp land and convert it into farms, he shut off the river from using many of these natural reservoir basins along its length. "Up north of us," a Louisiana planter told me, "they build levees that turn lots of marshes into farms; but, when high water comes, this system often turns a lot of our farms into marshes."

Since 1882 increase in flood heights from Cairo south has been due to better and higher levees; also, as the country gets more thickly settled, floods affect more people; so we hear more about them than formerly. In the big flood of 1849, for example, many of the thousands of square miles then inundated were uninhabited swamps.

One peculiarity of the Mississippi is its numerous sharp turns and curves (see map, page 245). This looping stream might well be called America's greater intestine. In these sharp curves great boils and whirls develop, with such power that often large vessels are turned completely around. It is this force, too, which cuts new channels and erodes the levees. It is said that in one place near the Southwest Pass so strong a whirl set in that in a few days it scoured the depth of the river from 30 to 104 feet (p. 283).

THE FATHER OF WATERS IS SOMETIMES A PRACTICAL JOKER

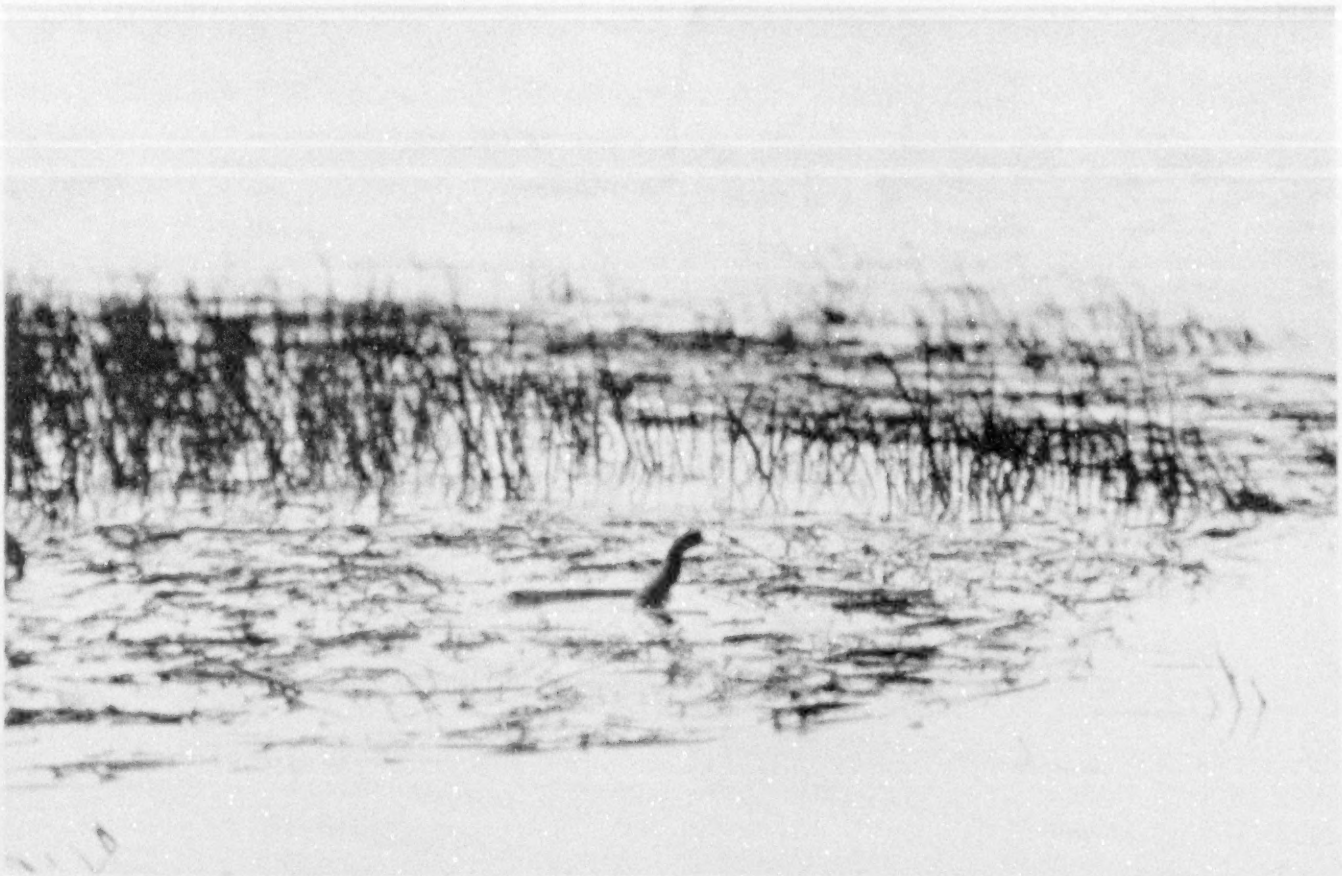
Cutting new channels, the river plays strange pranks. Consider the old town of Napoleon, Arkansas, famous among ante-bellum rivermen for its master card players. Once it had 3,000 people, busy banks, stores, and a naval hospital. Now, where once it stood, the Mississippi receives the flow of the Arkansas River. Other towns, plantations, and once prosperous communities have been swallowed up by the fickle, shifting current.

When the river gets too full, it runs over or breaks through its levees. In 1927 twice as much water came down the valley as the river could have carried, even had its banks held. But they didn't. They broke in many places. These breaks are called *crevasses*. It was the artificial crevasse blown with dynamite at Poydras, near New Orleans, which saved that city from disaster. This crevasse, letting surplus water out of the river, lowered its level enough to save New Orleans (see pp. 249, 251, 270).

WHY NEW ORLEANS WANTS SPILLWAYS

Many engineers say that danger from sudden accidental crevasses could be avoided by building permanent spillways along the lower river. Then the water above a certain safe flood level could be drawn from the main river and carried to the Gulf through auxiliary channels called "by-passes."

New Orleans is a walled city, like Baghdad. Levees form its walls; without them the river would engulf it, for it is



Photograph by Stanley Clisby Arthur

A WATER MOCCASIN SWALLOWS A YOUNG MUSKRAT

Driven from the swamps by rising water, incredible numbers of snakes swam to the levees and railway embankments. Often men with shotguns patrolled the water's edge and shot reptiles that came near refugee camps or levee repair gangs.

IT'S A POOR FLOOD THAT BRINGS NO TURTLE SOUP

When these flood fighters found enough dry wood, they stewed this 20-pound turtle. Like myriads of others, it tired of high water and crawled out on the driftwood to rest. "When a snapping turtle grabs you, he won't let go till it thunders," is an old saying among the river folk.

Official Photograph U. S. Army Air Corps

A CREVASSE BEGINS ITS DEVASTATING WORK

This break occurred in the Mississippi levee a few miles below Grand Tower, Illinois. Through the widening breach, shown in the foreground, the waters rush to inundate flat farm lands behind the dikes (see, also, text, page 285).

lower than the river. Parts of it are even lower than the Gulf of Mexico. Every drop of rain that falls in this Crescent City and all its sewage have to be pumped *up* and out of it. Levees protect the city from high water in Lake Pontchartrain on the north and from the river which flows south of it. On its east and west sides other levees are raised.

HIGHER LEVEES AT NEW ORLEANS WOULD CREATE DIFFICULT PROBLEMS

But these levees, pushed higher and higher as successive floods have risen to new levels, are now as high as practicable.

In 1882 the Mississippi at New Orleans rose to 14.9 feet; in 1922 to 21.3 feet. These figures represent heights above the Gulf level. Thus, as we have seen, in places New Orleans is *below* the Gulf.

In 1927 the flood was higher than ever before. It would have gone to 24 feet at New Orleans, experts said, had not the levee below the city been dynamited. This lowered the water in the river before the city. Even at 24 feet the levees *might* have held. There was grave fear they would not. Had they broken, a city of 419,000 would have suffered unthinkable disaster.

"This is why New Orleans wants spillways," an experienced Louisiana levee engineer told me. "We are not dissatisfied with levees. They are just as necessary here as farther upstream. But there are special conditions on the lower river and particularly at New Orleans. These call for supplementary relief, if we would hold flood heights to predetermined stages. This can be done by drawing water from the main river at times when great floods approach dangerous stages, and leading this excess water by a more direct route to the Gulf of Mexico, by means of spillways located either above or below New Orleans, or both.

"One reason for ceasing to raise the levees in this locality is that the supporting

MODERN MISSISSIPPI BARGES OFTEN CARRY AS MUCH CARGO AS 100 OLD-TIME PACKET BOATS

To aid navigation, the channel of the Mississippi, especially below Cairo, has in recent years been much improved by dredging and revetting. Already this change has resulted in a great revival of river-borne commerce. Twice as much cargo is carried now as in the days of the romantic old steam packets. This barge tow of new automobiles is on its way downstream from Memphis (see, also, text, page 277).

power of the soil is low, and it is very difficult in certain places to maintain the levees at full height; but the principal reason is more convincing:

"New Orleans is one of the leading seaports of the United States. The design of the public wharves along the entire river front was based upon a levee grade several feet below that which is now known to be necessary, if levees are to continue as the sole means of protection. The rail lines and streets serving these wharves have also been built to the lower grade.

"The wharves are not operated for profit, and it is quite certain that the National Government will never embark on a program of building or rebuilding wharves in any city. Raising of the wharves to conform to a higher levee grade would, therefore, be a slow process, probably requiring twenty years, while the raising and revamping of the levee system from above Cairo to the mouth of Red River will quite naturally be effected as quickly as possible.

"For that long reach of river there is no doubt that levees—higher and better levees—are the answer to the flood problem. And no informed person will question the assertion that the close confinement of flood waters from Cairo to Red River will increase the flood menace along the Mississippi below Red River, unless something is done to prevent it.

"For this reason it is necessary that relief measures be effected on the lower river either before or simultaneously with the raising and perfecting of the levees in the upper reaches."

FLOODS WERE FOUGHT BY DE SOTO'S MEN

After De Soto died and was buried in the Mississippi his party was overtaken by high water. A description of this flood of 1543, as set down by Garcilaso de la Vega, in his "La Florida del Ynca," is useful to us in studying the flood problem of to-day. It tends to show very plainly that the floods are not caused, as has often been stated, largely by deforestation, ditching, draining, and plowing up of the original grass mat in so many States drained by the river.

De Soto's men, after their failure to push westward, again set about building boats in which to pass down the Mississippi and across the Gulf to Mexico. It was then the flood came. De la Vega says:

"Then God, our Lord, hindered the work with a mighty flood of the great river, which, at that time (about March, 1543), began to come down with an enormous increase of water, which in the beginning overflowed the wide level ground between the river and the cliffs; then little by little it rose to the top of the cliffs. Soon it began to flow over the fields in an immense flood, and as the land was level, without any hills, there was nothing to stop the inundation.

"The flood was 40 days in reaching its greatest height, which was the twentieth of April, and it was a beautiful thing to look upon the sea where there had been fields, for on each side of the river the water extended over 20 leagues of land, and all of this area was navigated by canoes, and nothing was seen but the tops of the tallest trees."

NATURE MAY NEVER HAVE INTENDED THESE RIVER LANDS TO BE CULTIVATED

Since De Soto came much water has rolled this way. It always will. Some thinkers say Nature never meant these marshes to be diked and thickly peopled. Economists insist we farm too much land now. They say the same energy spent on dikes would have earned more had it been applied to farms on higher ground. Maybe so. When you look back at periodic waste from floods, you feel this might be true.

But such pondering is of the past. Now there is no turning back. To-day rich cities stand behind the levees. Sugar factories flourish and sawmills hum. To these, linked by rail and pavement, vast plantations add their income. Here all wealth multiplies and populations grow, just as levee systems improve.

In our complex national economy this rich region plays a big part. When floods menace it, the whole Nation springs to its defense. Engineers say this defense is difficult; history shows it. Perhaps perfect defense can never be, for levees are against Nature. But man persists, like the ant whose hill is plowed. He pays for thwarting Nature's laws when he feels the prize is worth the price.

LIVING JEWELS OF THE SEA

By William Crowder

Author of "The Life of the Moon Jelly" and "Marvels of Mycetozoa," in the National Geographic Magazine

With Illustrations in Color from Paintings by the Author

COMPARATIVELY few individuals are aware of the teeming life that may exist in a single glass of sea water. Sometimes a random dip into what is apparently clear water will reveal to the microscope the existence of a world of plants or animals minute in form, yet seemingly limitless in numbers.

This strange world is peculiar to no particular ocean, but is to be found in every quarter of the globe. And, while the organisms that compose it abound to a greater extent in some regions than in others, no place has yet been discovered where surface waters are entirely free from them.

Furthermore, these organisms are of a rare and unsuspected beauty—a beauty so totally dissimilar to that which distinguishes the larger and more familiar residents of our planet that there is really no standard of comparison.

To this population of small floating plants and animals the term Plankton has been applied; but, in the strict modern usage of the word, Plankton is taken to include also nearly all creatures that can swim, regardless of their size or of the depth at which they live, as distinguished from those that are fixed to or actually crawl upon the bottom.

MINUTE SEA LIFE FEEDS GIANT WHALES

So abundant is this minute sea life that a creature as gigantic as the Greenland whale, which often attains a length of 45 or 50 feet, subsists solely upon it. One can appreciate, therefore, the truth of the remark of the late Prince of Monaco, famous oceanographer, to the effect that no shipwrecked sailor adrift in a boat or on a raft need starve if equipped with a simple muslin net.

Tiny as these sea forms are, many of them secrete shells. As the living organisms die, their shells settle to the floor of the ocean, in some regions comprising almost the sole constituent of the material that forms the bottom.

From such countless billions of shells were the famous chalk cliffs of England formed. Long ago they were dropped upon the floor of an ancient sea, and were piled so high that those in the undermost layers were squeezed into a shapeless mass; later, by some convulsion of Nature, they were lifted out of the water.

ANIMAL PLANKTON IS ABUNDANT

Minute animal Plankton appears to be as abundant 600 feet deep as at the surface. In this vertical range alone it is estimated that every square mile of salt water contains upward of sixteen tons of planktonic skeletons. And there are innumerable forms that have no shells.

The skeletal structure of some of these creatures, the Foraminifers (see Color Plate VII), is composed of lime; that of others, the Radiolarians (see Color Plate IV), is formed of silica—a transparent, glasslike substance as hard as flint.

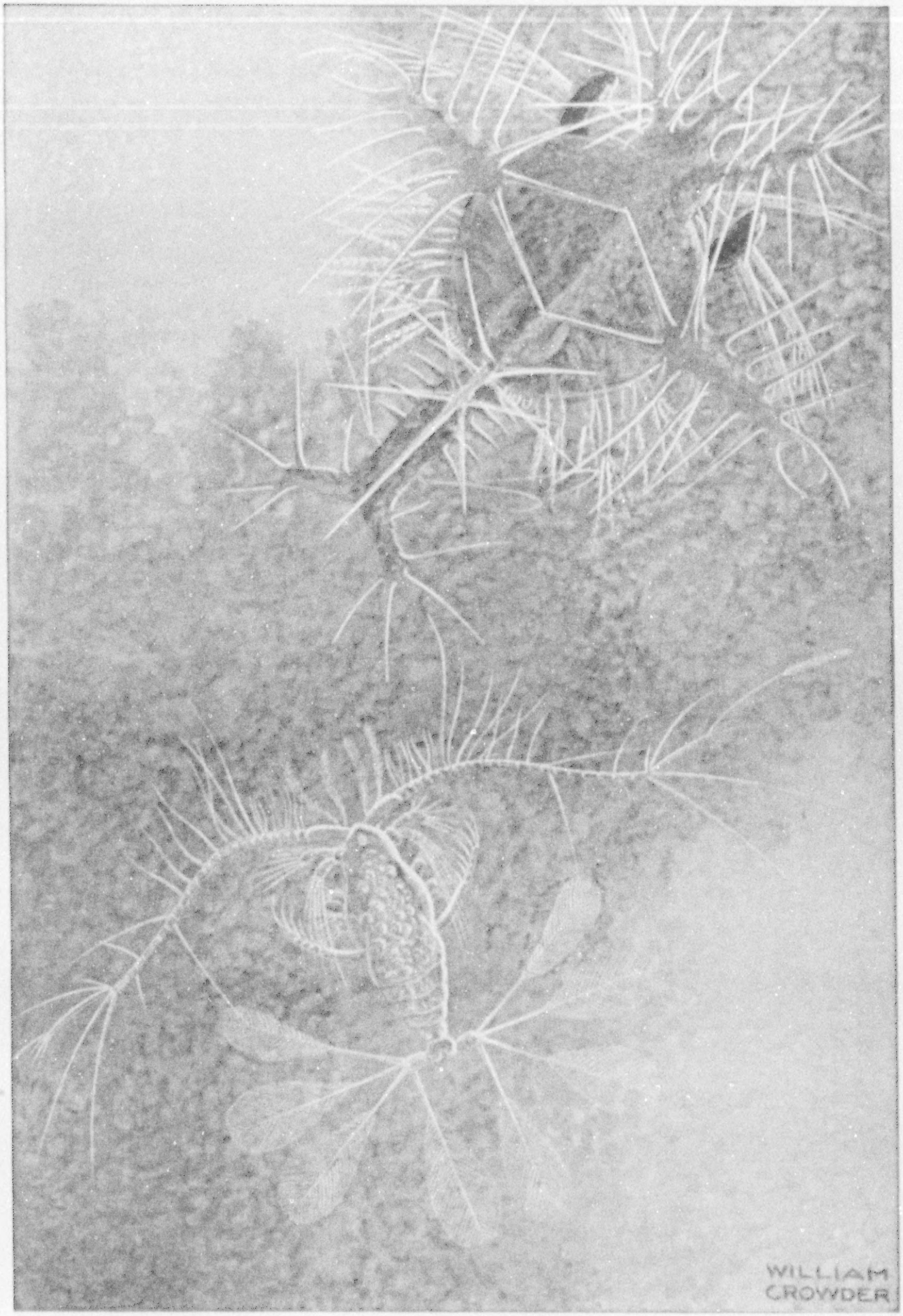
Among the Foraminifers, the well-known genus Globigerina is a representative example. These animals, despite their complex forms, consist of a single cell. They are extremely abundant in warm and temperate seas (see page 304).

The shell consists of successive chambers, usually somewhat spirally arranged, with a mouthlike aperture in the largest chamber, and the entire structure is pierced with numerous fine perforations.

Long, delicate spines of lime radiate from the surface of the chambers, while from the tiny punctures and the shell mouth streams the protoplasm, frothy and latherlike, which lodges between the spines, or extends outward in gauzy threads for the capture of prey. Yet, on occasion, the creature can withdraw completely within its shell.

The arrangement of the spines, which increases the frictional resistance to the water, and the bubbly envelope investing the shell constitute a unique mechanism adapting the animal to a floating life.

Not only are the Globigerina distin-



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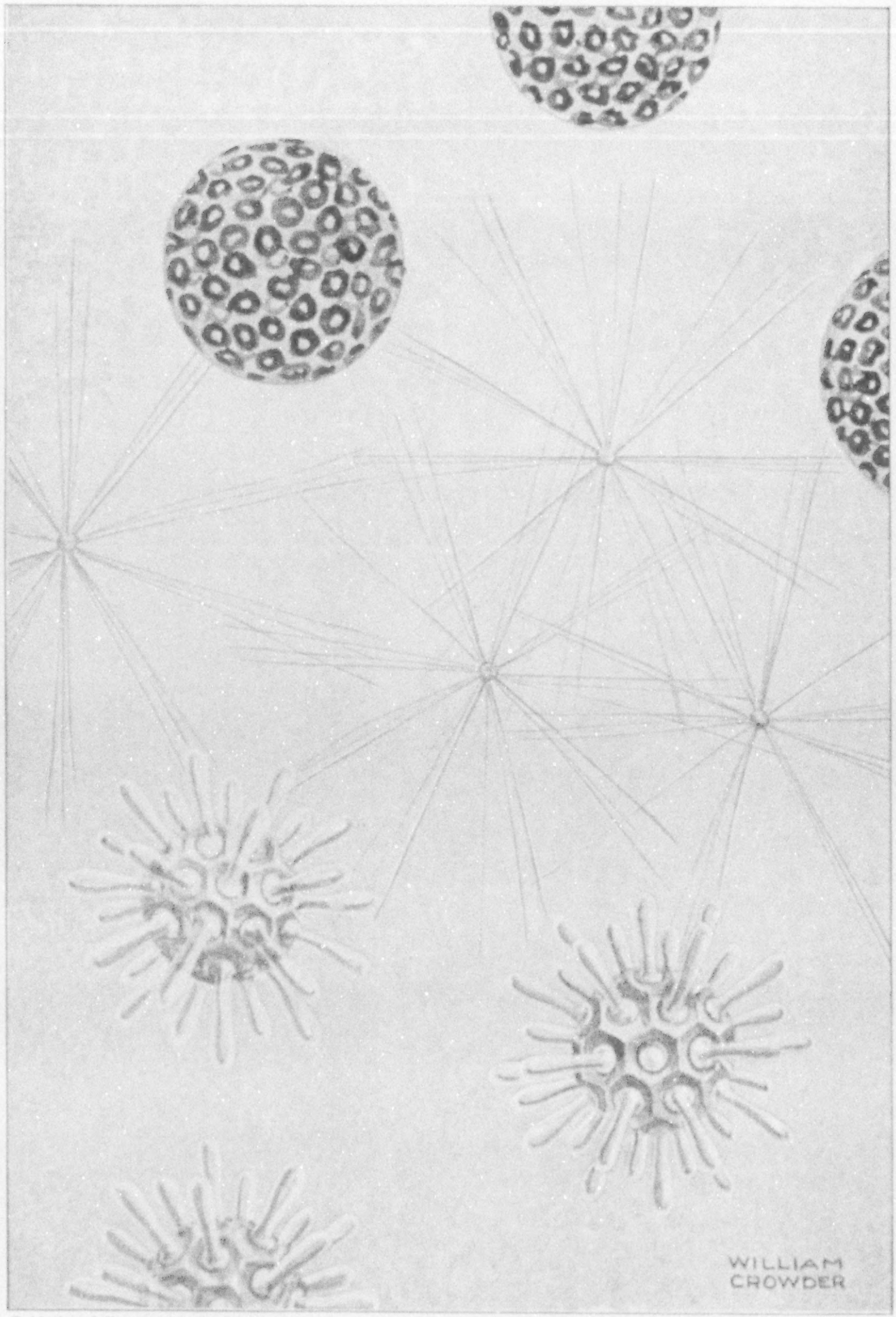
STRANGE FORMS FROM THE SOUTH PACIFIC OCEAN

In the minute life of the sea, many creatures are singularly endowed with spines and other bizarre appendages which increase the frictional resistance of the water, enabling them easily to float. The crustaceans here shown (upper, *Sergestes*, and lower, *Calocalanus pavo*) are dwellers in the open sea.



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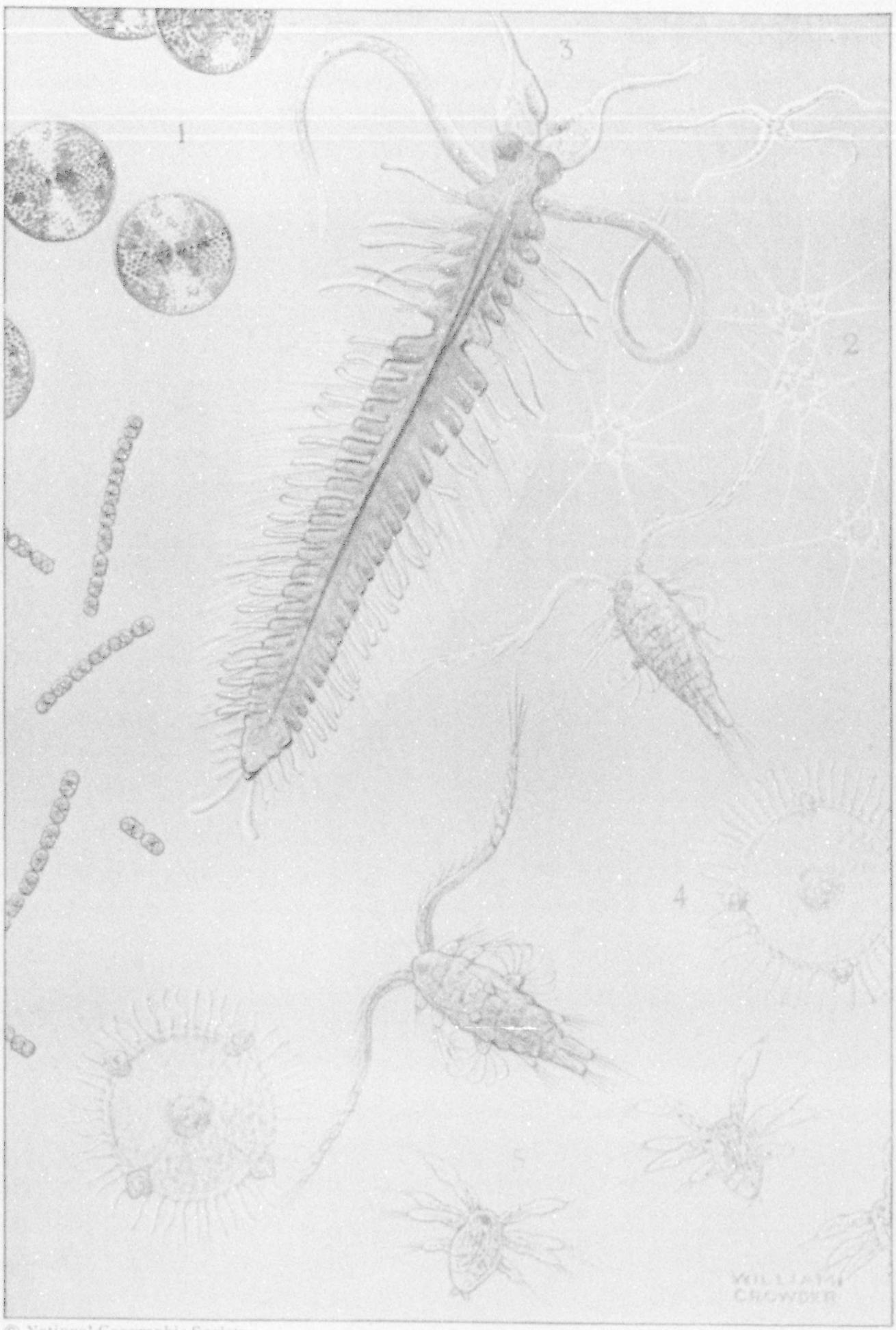
SEA PLANTS ADMIRABLY ADAPTED TO A FLOATING LIFE

These forms, collected in the Atlantic (top, *Halosphaera;* middle, *Chaetoceras*, and bottom, *Rhabdosphaera*), possess curious radial processes which sustain them in the water. All are one-celled organisms, and most of them are invisible to the naked eye; yet, simple and small as they are, their existence is of enormous import, for it is chiefly upon them that all animal life of the sea ultimately depends for food.



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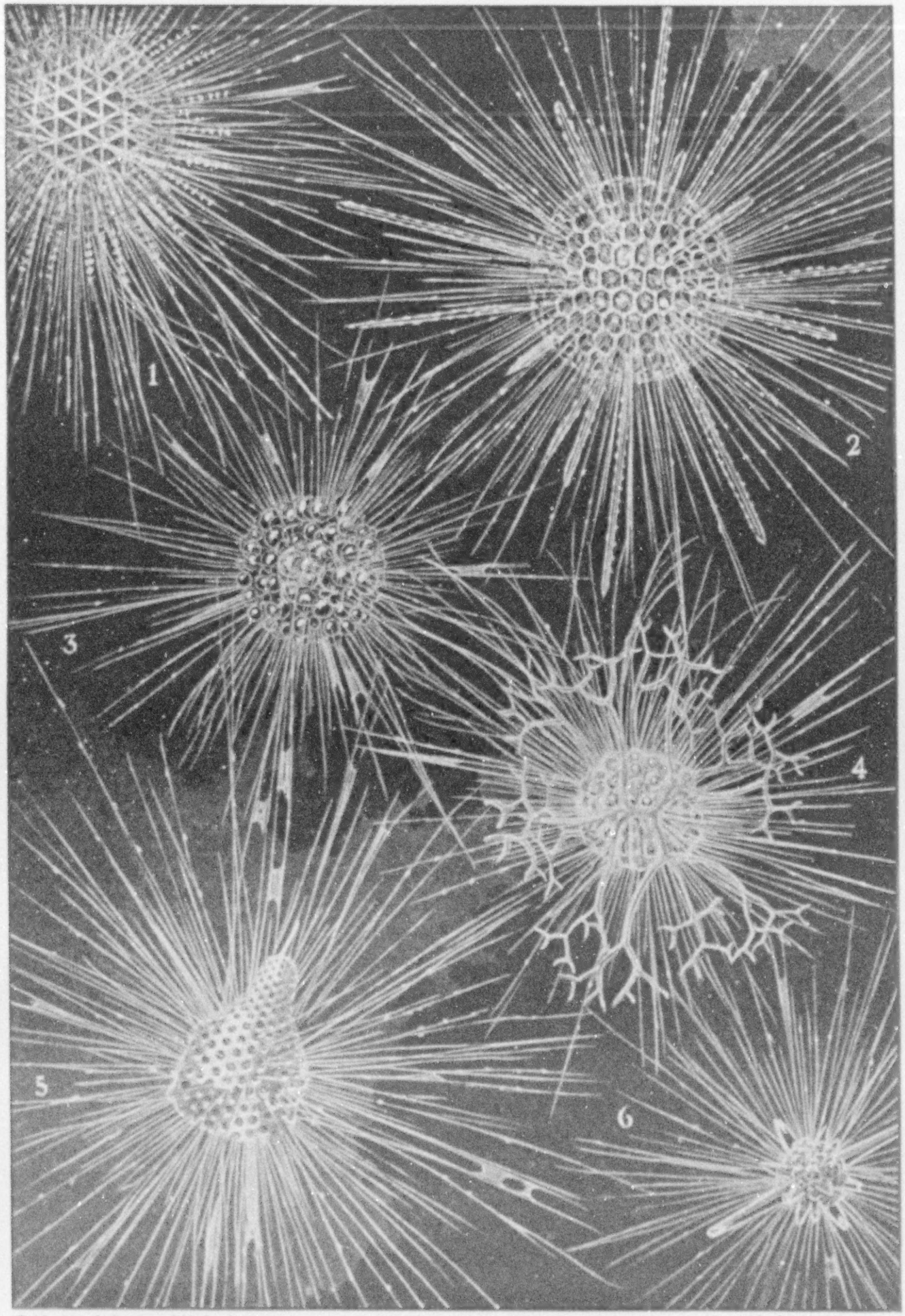
AN OCEAN MENAGERIE REVEALED BY THE MICROSCOPE

While nearly all regions of the ocean abound in microscopic life, there is considerable variation of forms in different areas. Those forms prevailing in the warmer seas near the equatorial belt are generally unlike those living in colder waters. These specimens were taken from a towing made in Long Island Sound. They are: 1 and 2, Diatoms; 3, Worm (Marine); 4, Hydroid jellyfish, and 5, Copepod crustaceans.



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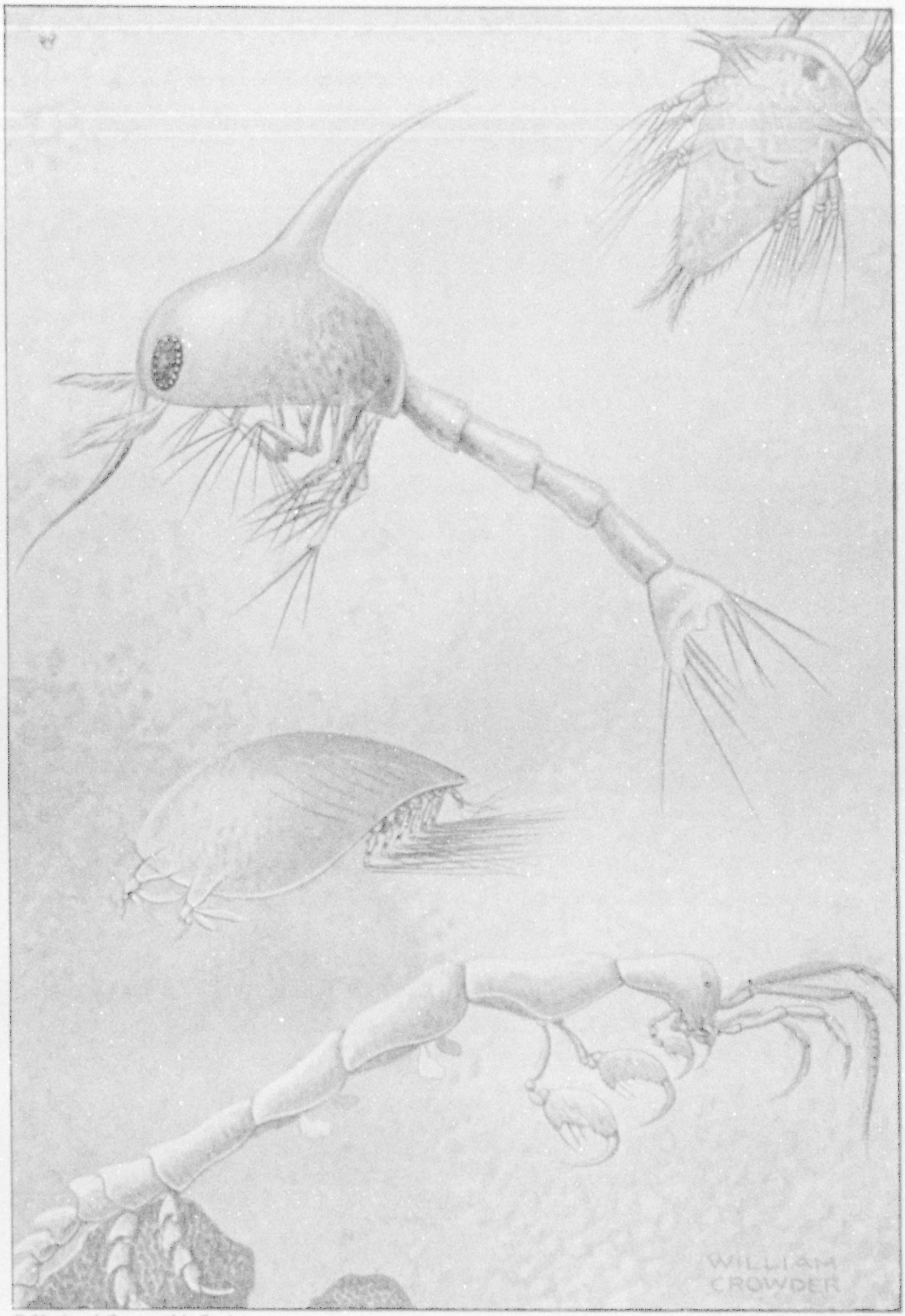
RADIANT CREATURES FROM THE MEDITERRANEAN

To those unacquainted with their nature, these Radiolaria would never be taken for animals. Yet under the microscope they may be seen to capture other creatures and to eat and grow and to live the life of typical animals. But they, too, are food for other and larger animals, and their skeletons are thickly strewn over the ocean floor in some parts of the world. The species are: 1, *Aulosphaera elegantissima*; 2, *Heliosphaera inermis*; 3, *Thalassicola pelagica*; 4, *Coelodendrum gracillimum*; 5, *Eucyrtidium craniodes*, and 6, *Amphilonche messanensis*.



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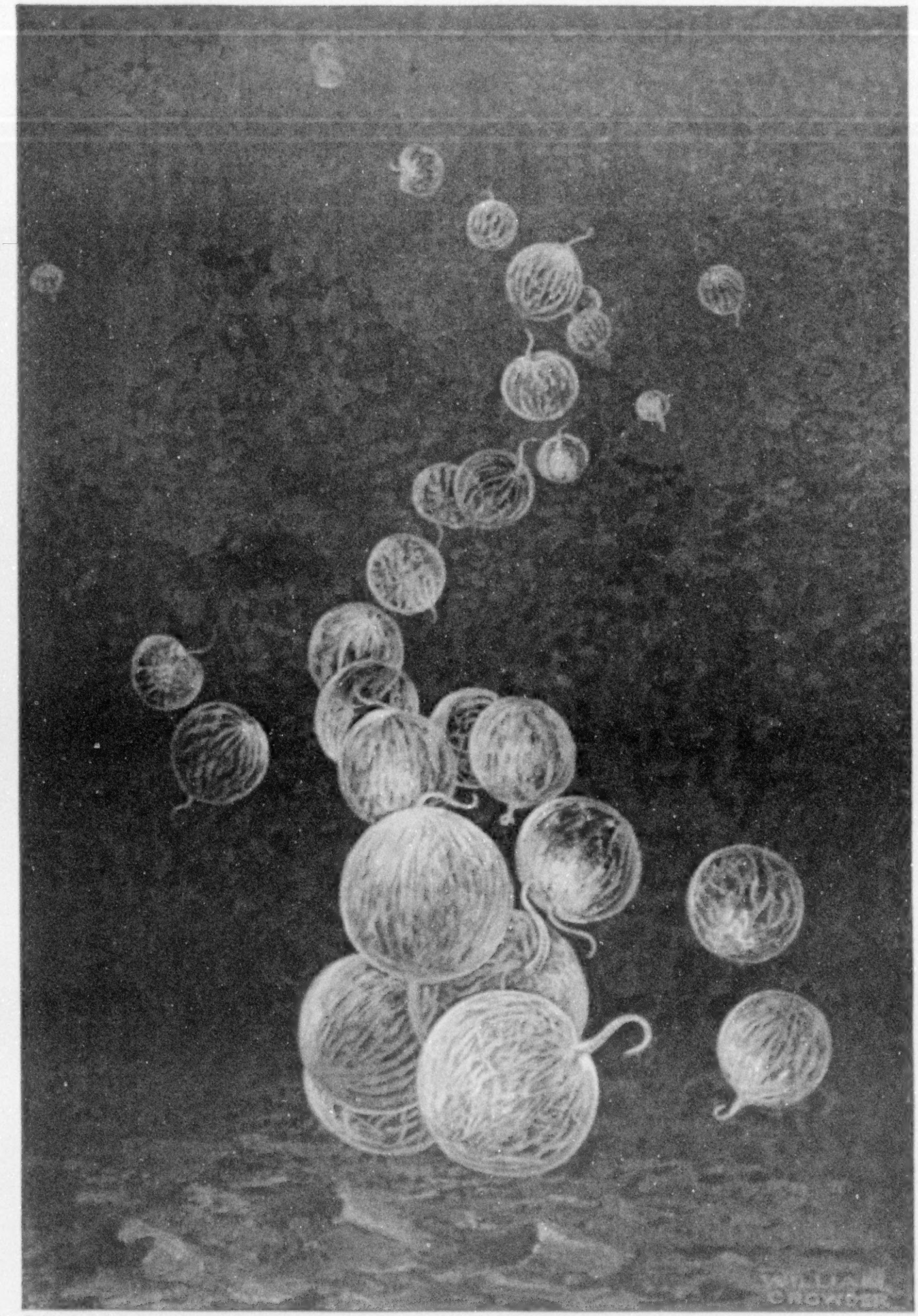
MINUTE HOBGOBLINS OF THE DEEP

While many of the tiny crustaceans of the open sea are merely the larval forms of much larger creatures, there also are great numbers of Plankton whose adult size is barely discernible to the naked eye. At the bottom of the picture is Caprella, an adult animal. The others are various kinds of crustaceans in their larval stages. The specimens, which were taken off the Atlantic coast of the United States, include: 1, *Nauplius* larva; 2, *Zoea* larva; 3, *Cypris* larva; *Sacculina*, and 4, *Caprella*, fully matured.



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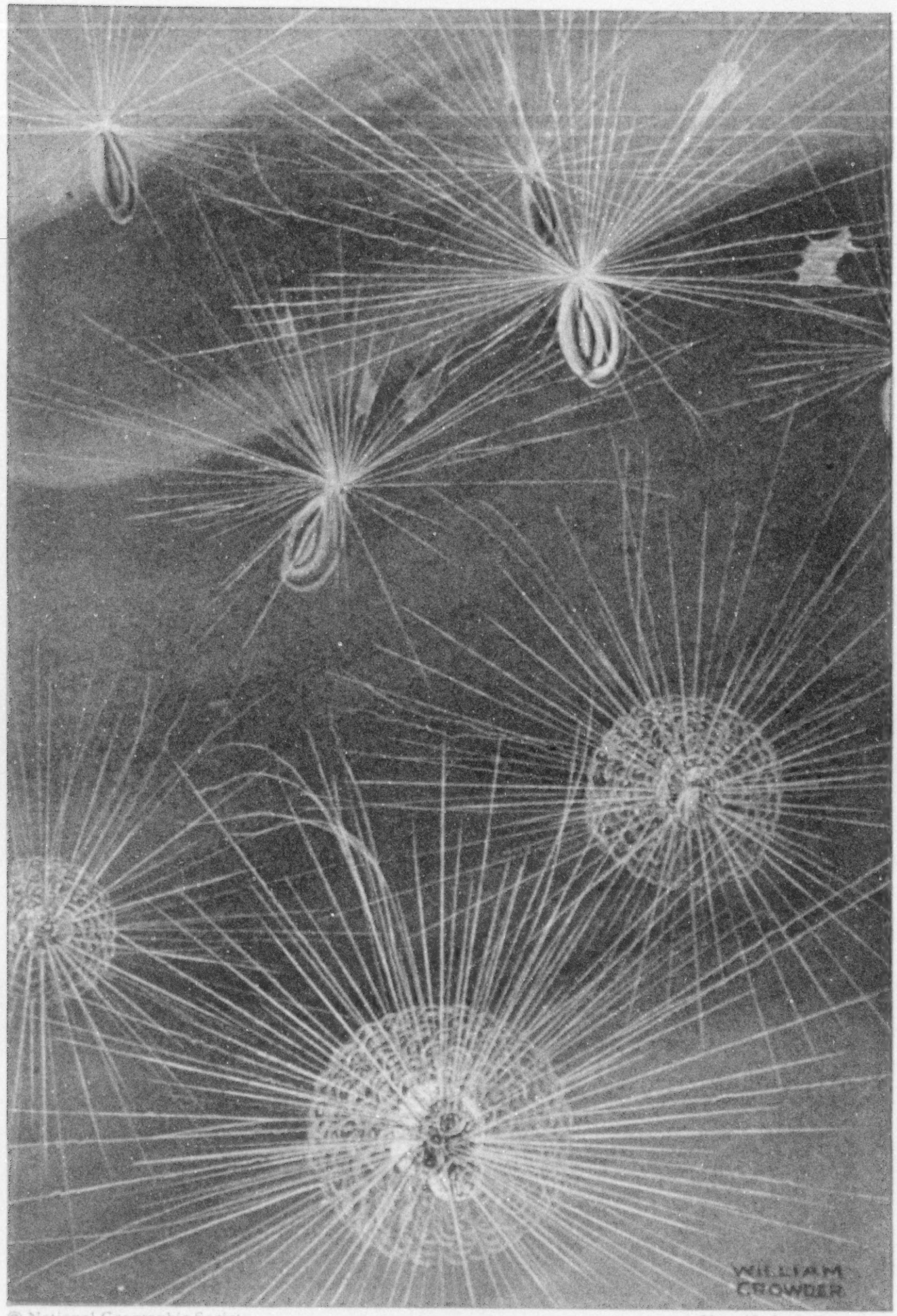
THE TINY CREATURES THAT MAKE THE OCEANS GLOW

Of all the phosphorescent animals of the sea, Noctiluca is perhaps the best known. This little light producer exists in enormous numbers in warm and temperate waters. There are several species of Noctiluca, and each has a quality and color of luminescence peculiarly its own. This group of *Noctiluca miliaris* came from the Gulf of Mexico.



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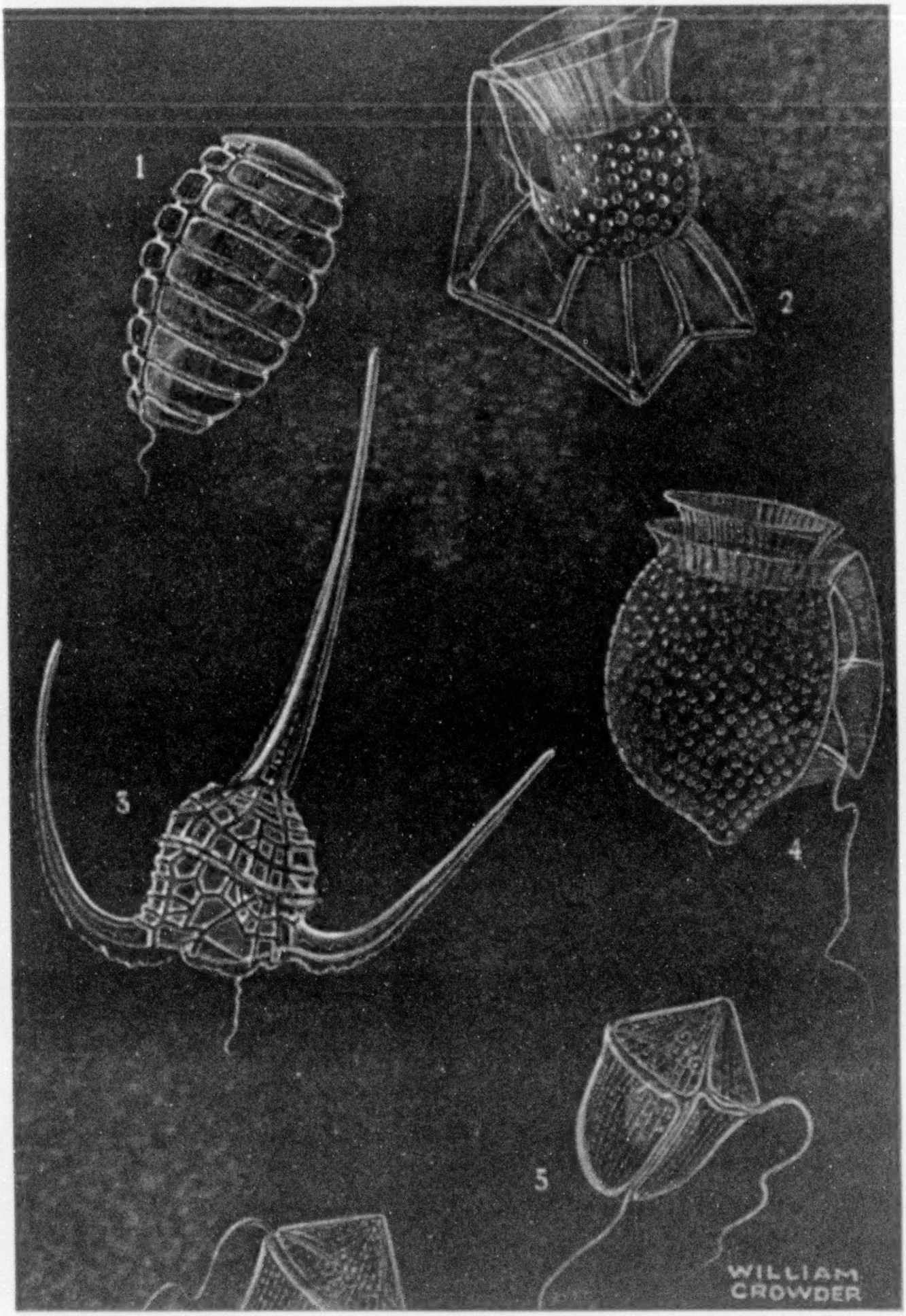
THEIR SKELETONS FORM THE FAMOUS CLIFFS OF DOVER

In some parts of the world the dead shells of these Foraminifera falling to the bottom of ancient seas have been uplifted later to form coast lines. There are hundreds of species of Foraminifera, but the best known are those of the genus Globigerina. The upper Foraminifera are *Quinqueloculina costata*, the lower are *Globigerina rubra*.



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THE DISTRIBUTION OF THE DINOFLAGELLATES IS WORLD-WIDE

They are found at various depths, from the shore to the open oceanic reaches, and in the waters of the Tropics as well as in the polar seas. All are microscopic; the largest, a species of Noctiluca (see also Color Plate VI) is visible as a tiny globule. The smallest is seen only with the aid of a high power microscope. They were long held by naturalists to be plants, their true animal nature being determined only in recent years. These species from the North Atlantic Ocean are: 1, *Polykrikos* Schwarzi; 2, *Ornithoceras* sp.; 3, *Ceratium reticulatum*; 4, *Dinophysisacuta*, and 5, *Goniaulax fragilis*.

guished for their great beauty and for their interest to microscopists, who have developed the study of them into a hobby, but they have achieved a distinction quite noteworthy in another respect. Their skeletons are the chief constituent of those great expanses of both the former and present ocean beds familiarly known as Globigerina Ooze (see page 301).

PLANKTON OOZE COVERS MILLIONS OF SQUARE MILES OF OCEAN BED

Globigerina Ooze is estimated to cover an area of nearly 50,000,000 square miles —22,500,000 square miles in the Atlantic Ocean, nearly 15,000,000 square miles in the Pacific Ocean, and more than 12,000,000 square miles in the Indian Ocean.

It is to the Radiolarians, however (see Color Plate IV), that the palm of beauty must be accorded, for these are without doubt the loveliest of all protozoans. Their seemingly endless variety of shapes is a constant source of pleasure to the collector. Many are globular and perforated, and, as with Globigerina, the soft body substance can be seen streaming out for food.

Not a few are like fairy baskets formed of the most exquisite latticework; others still have a crystallike sphere within an outer lacelike covering of clear glass, resembling those curious balls of jade carved by the ancient Chinese, wherein one delightful creation incloses another yet more lovely (see page 300).

ATOMIC CREATURES CAUSE SEA'S "PHOSPHORESCENCE"

Another group of one-celled animals that deserves mention is that known to zoölogists as the Dinoflagellates (see Color Plate VIII). They are of world-wide distribution; and few persons, however slightly familiar they may be with the animals of the sea, can have failed to note some evidence of the presence of these attractive organisms.

It is due chiefly to certain species of the Dinoflagellates that the sea becomes phosphorescent at night, while by day their enormous numbers often cause the waters to assume a deep tinge of brilliant red.

There are many different Dinoflagellates that produce the amazing spectacle of phosphorescence, but the commonest of all, perhaps, are species of Noctiluca (see Color Plate VI and page 302).

These tiny creatures, not often larger in diameter than the period which ends this sentence, live upon other organisms smaller still. Under the microscope they may be observed selecting their food from the surrounding medium, revealing that they have their preferences, just as have higher animals whose bodies are composed of billions of cells.

They are transparent and jellylike and their shape in general may be compared to that of an apple the stem of which is drawn out into a whiplike lash. At the base of this lash, or flagellum, is the mouth, a groovelike orifice reaching nearly halfway around one side. From the mouth extrudes a much smaller and finer hairlike organ, a second flagellum.

HOW DO THESE CREATURES MAKE THE PHOSPHORESCENT GLOW

The color, the beauty, and the intensity of the light emitted by so small a creature have been subjects of considerable investigation, but the secrets are still unrevealed. It has been possible, of course, to isolate the chemical compounds causing this light, yet of their ultimate nature practically nothing is known. The term "phosphorescent" is commonly applied because the illumination resembles the glow of phosphorus; actually the radiance has no relation to that element.

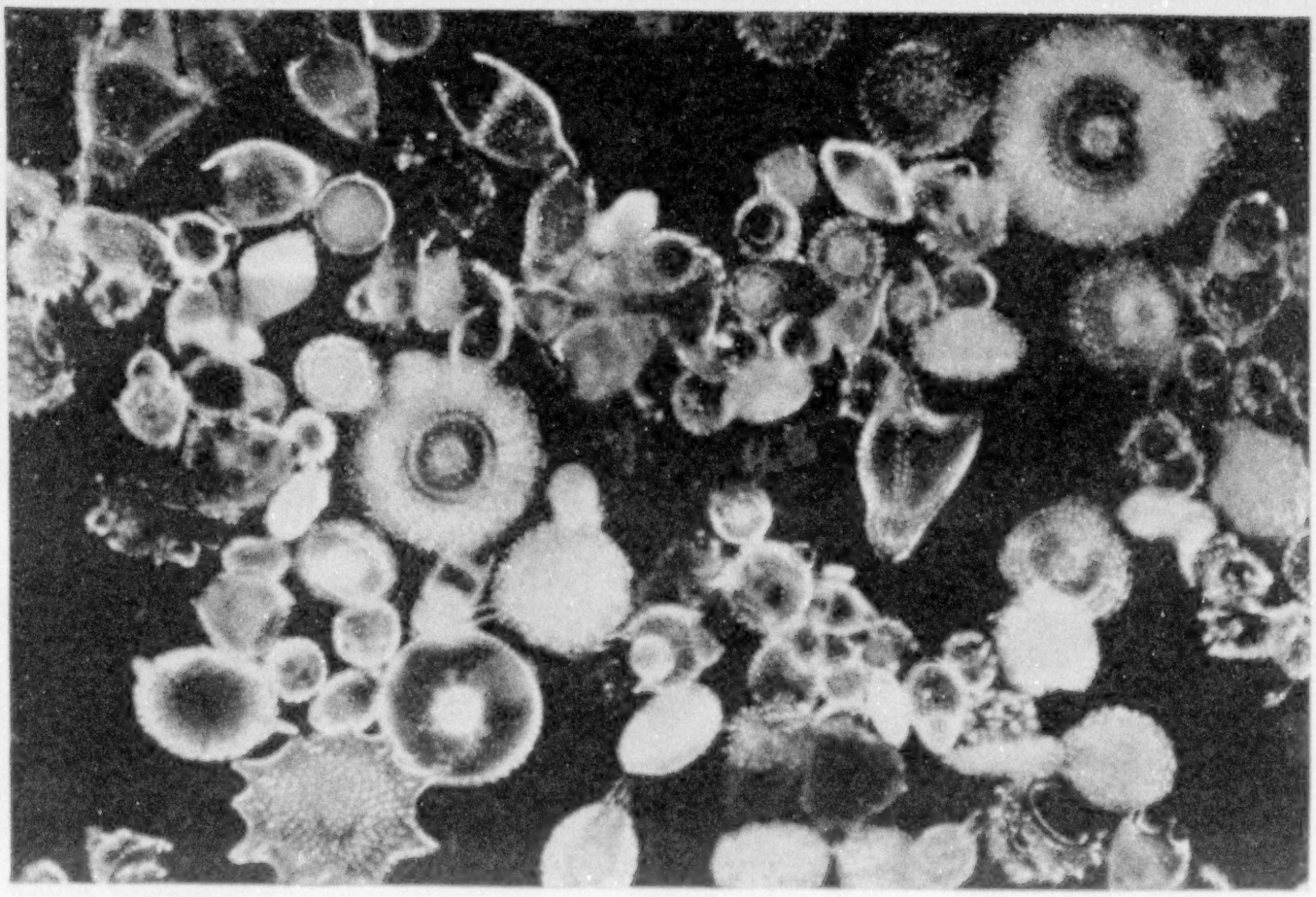
Two very interesting properties are peculiar to the light of Noctiluca. It contains no light rays that are invisible to the eye and it has no heat. It is what may be called "cold light."

A beam of sunlight passed through a prism can be projected onto a screen to present a color picture, or spectrum, composed of visible hues, extending from deep purple through the blues and yellows to deep red. If a sensitive photographic plate be put in the same plane as the screen, in the absence of all other light, an image of the color picture will be recorded; but, together with those colors that are visible, there will appear on the developed plate a record of rays that are invisible to the eye. These are found at each end of the spectrum and are known as the infra-red and the ultra-violet rays.

No artificial light has ever been devised that eliminates all these invisible rays, but the light of Noctiluca is devoid of them;

HAULING IN THE TOW NET

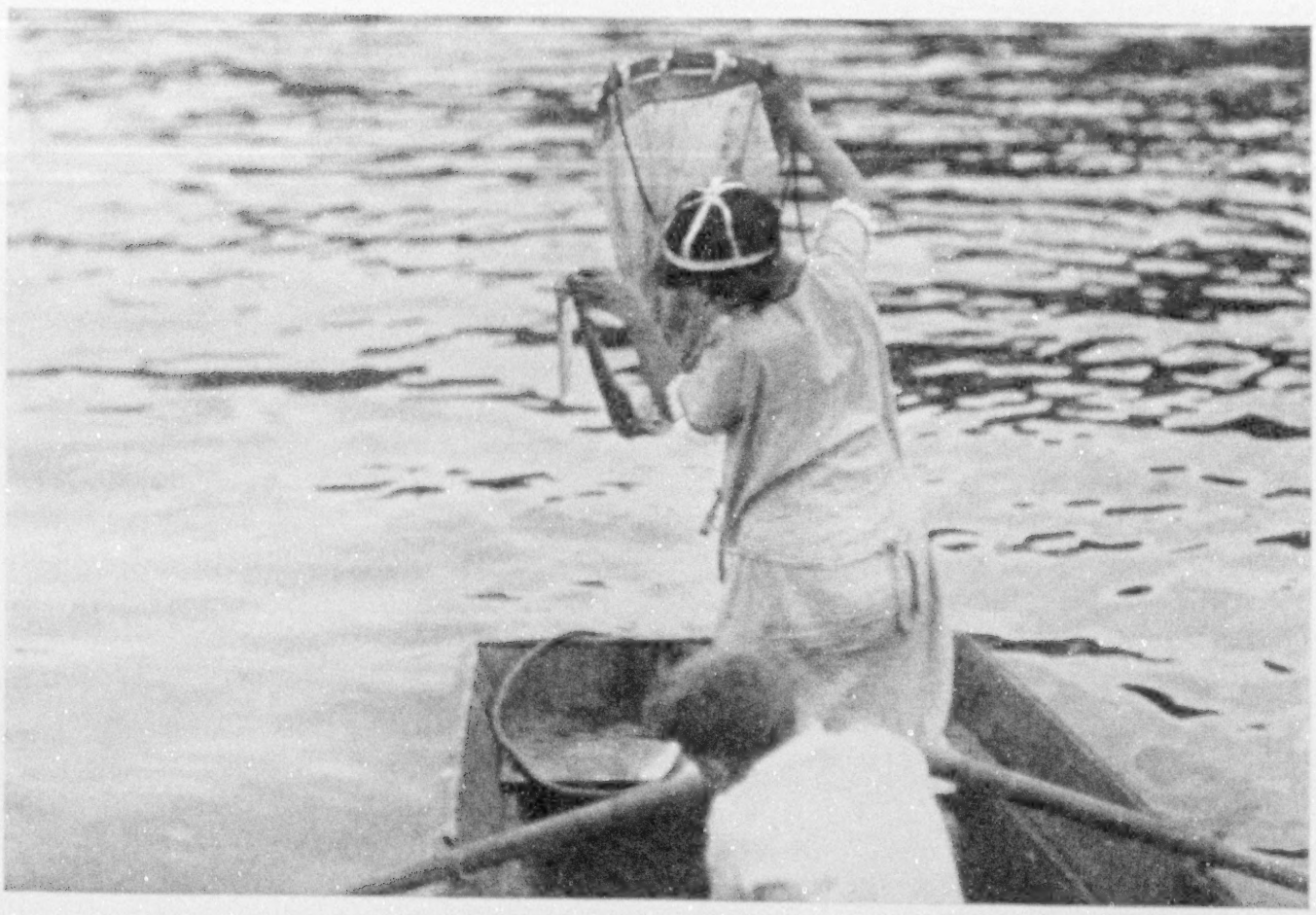
A simple, cone-shaped, muslin net, with its apex secured around the mouth of a test tube, is towed along the surface of the water behind a rowboat. By this means a collector can quickly and easily obtain an abundance of microscopic organisms of great beauty.



Photographs by William Crowder

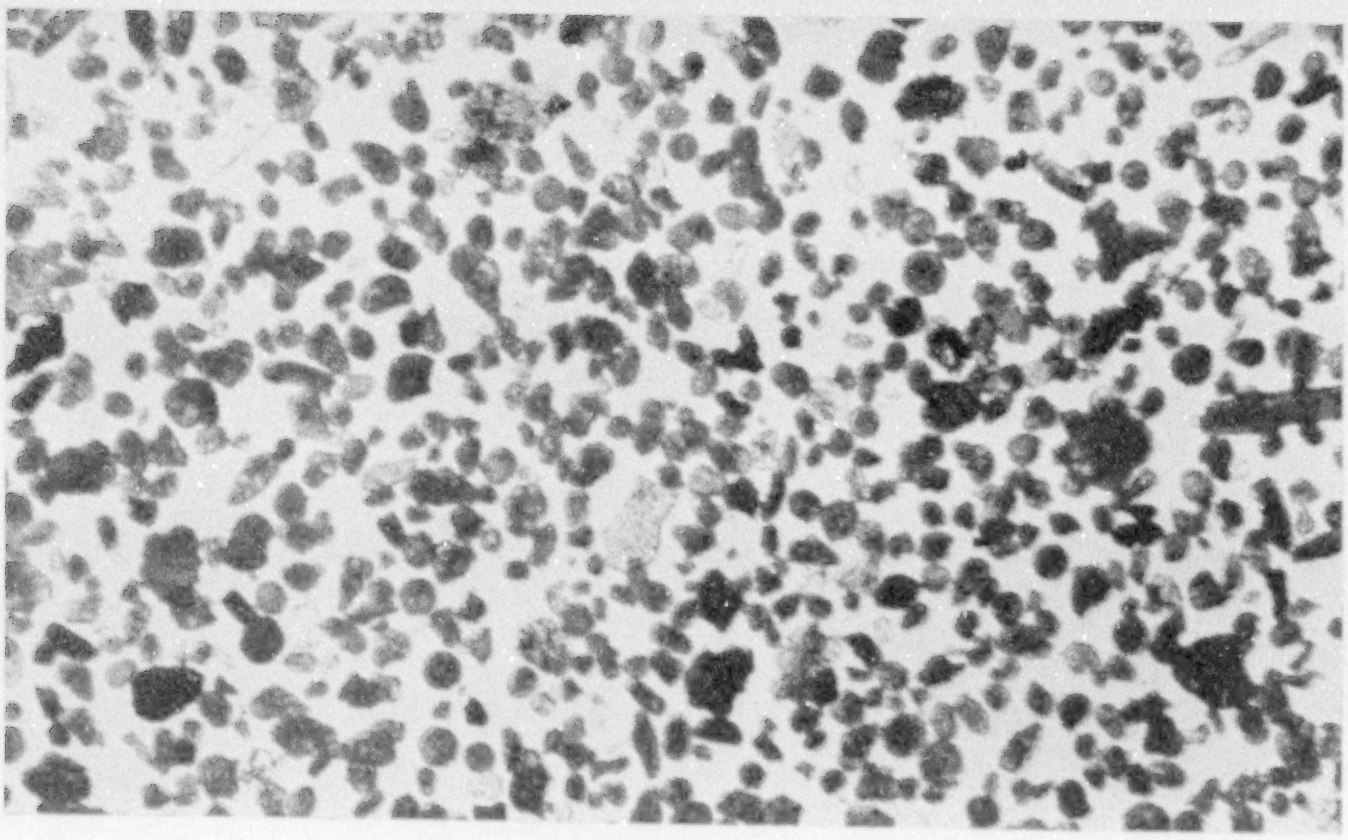
RADIOLARIANS ARE THE LOVELIEST OF ALL PROTOZOANS

Unlike most other animals whose hard parts are composed more or less of lime, these curiously beautiful forms have skeletons of silica, a transparent, glasslike substance as hard as flint (see text, pages 290 and 299). Enlarged 52 diameters.



EXAMINING THE HAUL

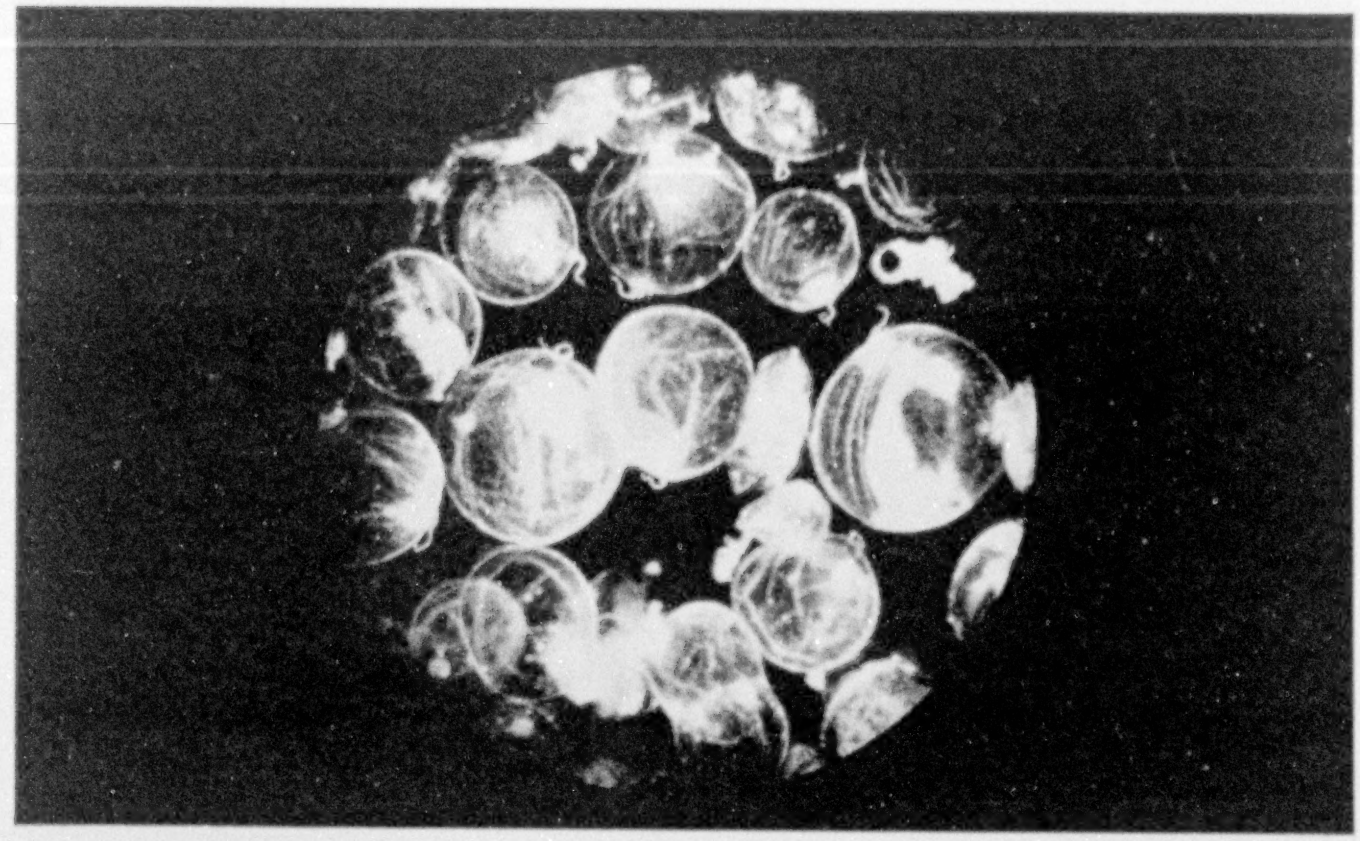
The tow net, unlike many other devices for the capture of prey, is infallible. Invariably the collector is rewarded with a plentiful supply of minute but interesting forms awaiting the revelation of the microscope.



Photographs by William Crowder

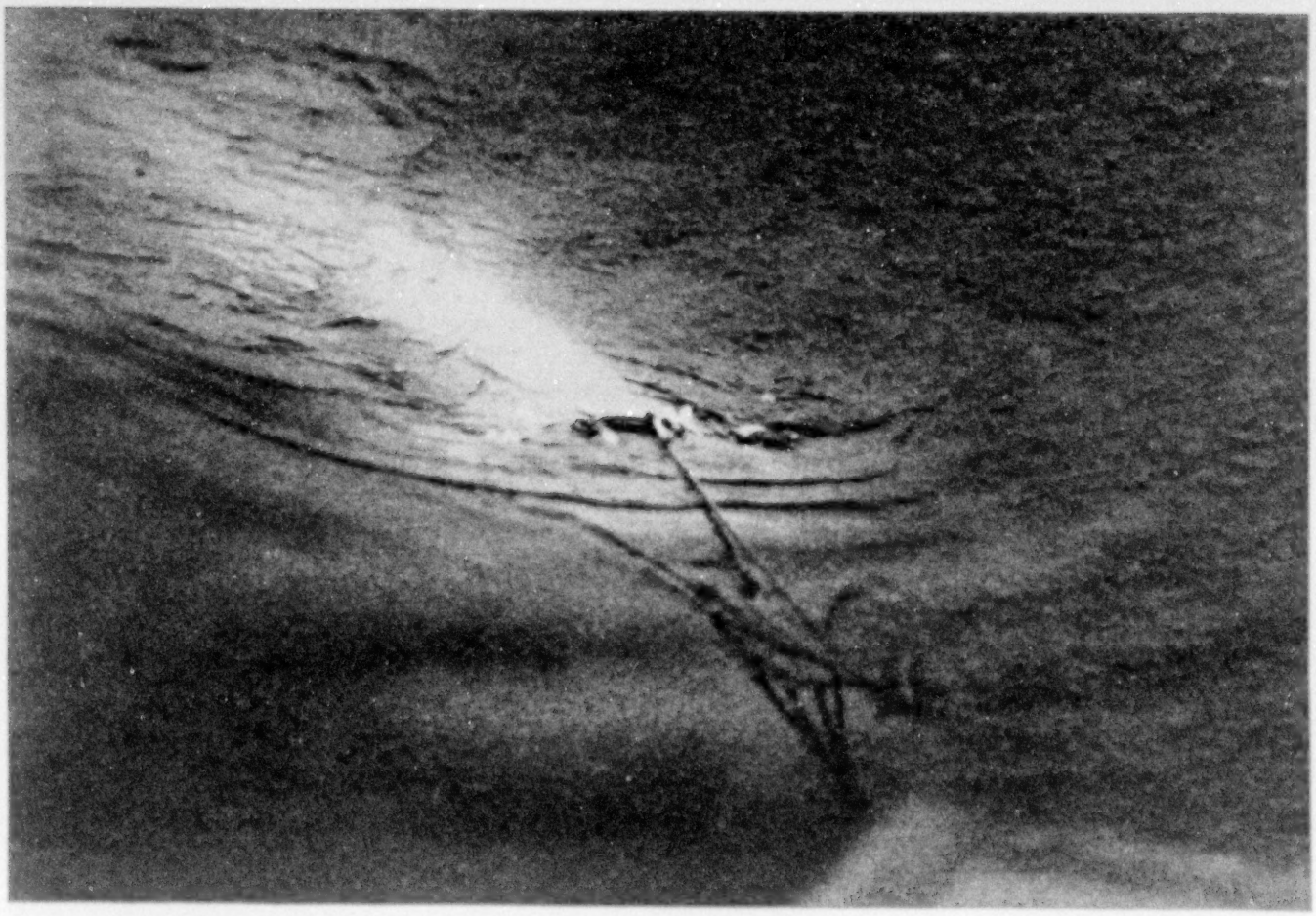
FORAMINIFEROUS OOZE COVERS MILLIONS OF SQUARE MILES OF OCEAN BED

The mud of the sea's bottom in many parts of the world is composed almost wholly of the shells of microscopic animals. When the living organism dies, the shells sink to the floor of the ocean in a continual shower. All these forms, though of various sizes, were exceedingly small in life. Enlarged approximately 55 diameters.



NOCTILUCA CAUSES MOST OF THE SEA'S "PHOSPHORESCENCE"

The various species of Noctiluca appear to be wholly efficient in illumination, since they have no light rays which are invisible to the eye (see text, page 290). These minute, remarkable forms of sea life are now known to be true animals of the one-cell Dinoflagellate group. *Noctiluca miliaris*, here shown, is enlarged 50 diameters.



Photographs by William Crowder

A PHOSPHORESCENT TOW NET

The tow net at night often glows with the fire of millions of minute phosphorescent creatures, leaving in its wake a luminous silvery trail. In making the print, the author-photographer endeavored to obtain as much contrast as possible between the net and the remainder of the photograph, in order that the luminous feature might be better depicted.

so it seems that its illumination is about 100 per cent efficient, as no light-producing energy appears to be lost.

Noctiluca, however, is not the most powerful light-producer for its size. That distinction belongs to another planktonic creature, the little ostracode crustacean Cypridena.

MAN HAVING CRUSTACEAN'S ILLUMINATING POWER COULD LIGHT CITY

The light from this animal is so strong that one part of its luminous gland in about two billion parts of water will impart a visible glow to this medium. If a human being possessed an organ giving the same proportionate volume and degree of illumination, he would be capable of lighting up the business area of a city like Washington, D. C.

Yet it seems that this light is of doubtful value not only to Cypridena, Noctiluca, and other animals, but to those higher creatures that possess it, such as certain insects. In the latter instances it is very probable that luminescence is merely an incidental manifestation of a more fundamental cause that has for an end not the production of light, but sexual attraction, or possibly something still far removed from our inquiring minds.

THE NOCTILUCA SEEMS TO BE IMMORTAL

It is hardly possible to speak of Noctiluca or, for that matter, of any other planktonic protozoan without adverting for a moment to its unique distinction in the world of living things as belonging to the only class of animals which are literally immortal. Noctiluca never dies from so-called natural causes, such as old age. In truth, except for accidental injury or other bodily harm, it lives forever, so to speak.

The secret of its immortality lies in its mode of reproduction. At a certain stage in the life of the individual a division of its body takes place. A constriction is first formed in the cell wall around the middle of the sphere, this constriction rapidly growing deeper and finally separating the animal into distinct and equal parts.

Each of these parts in turn becomes a smaller but exact duplicate of its single prototype. That is to say, what was originally one adult mother cell has resolved itself into twin daughters.

Photograph by William Crowder

A CLOSE-UP OF THE HAUL

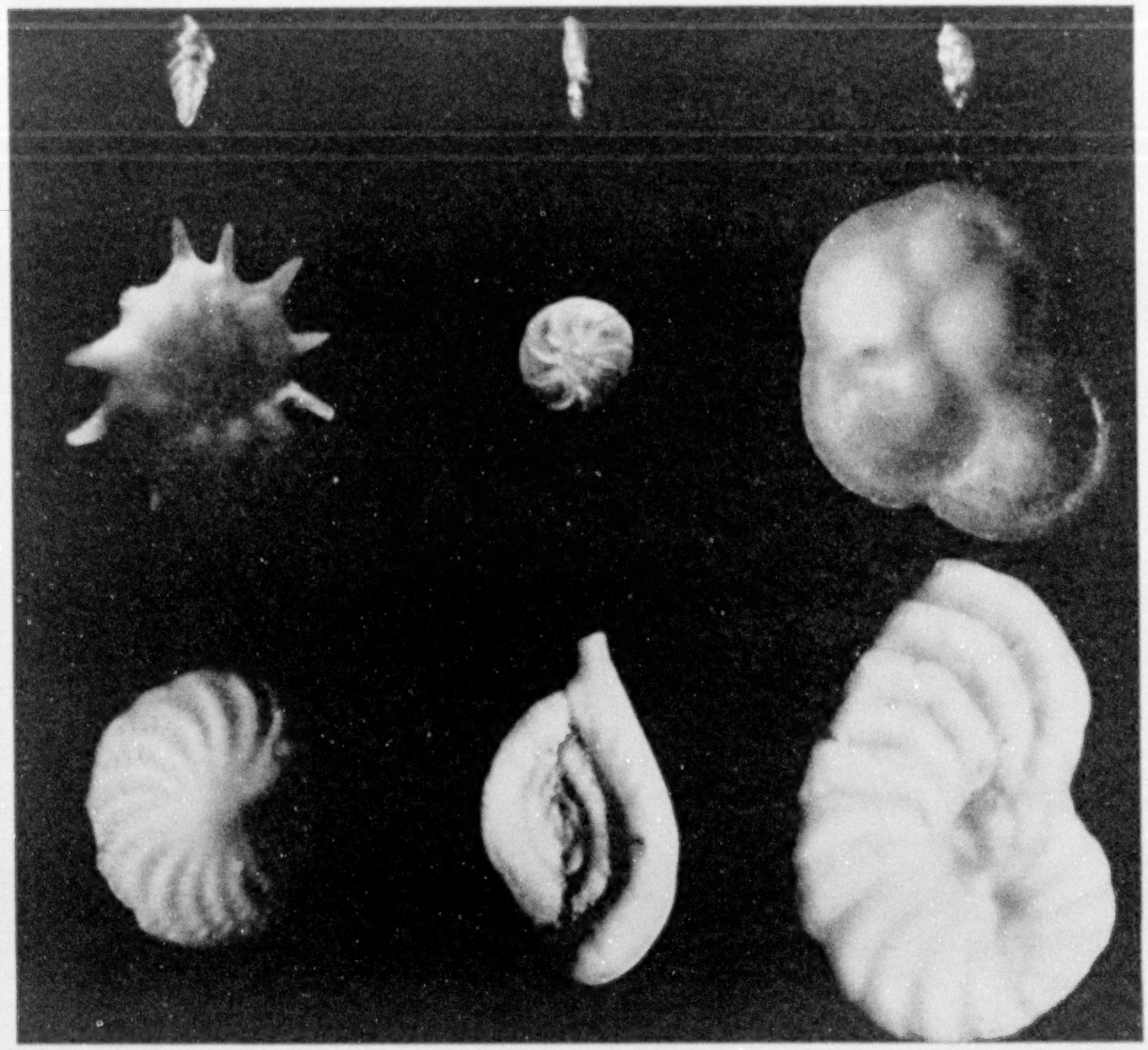
The cloudlike mass in the lower part of the test tube is composed of many thousands of tiny forms of plants and animals. Individually, the majority can barely be seen with the naked eye. Their concentration here in such numbers is the result of the tow net drawn through the water (see pages 300, 301, and 302).

When the twins grow older they likewise divide, and the cycle continues.

It should be observed, however, that this method of reproduction by fission, as it is termed, does not go on indefinitely without variation; for in some succeeding generation two individuals will meet, a fusion of their cell substance will occur, and the pair will appear to coalesce into a single unit, thus apparently reversing the process of division.

MOST PLANT LIFE OF THE OPEN OCEAN IS FLOATING AND MICROSCOPIC

Sooner or later the fused cells develop prominences or buds on the surface of the sphere. These ultimately become detached and swim away as zoöspores, or young Noctilucas, who, when they grow



Photograph by William Crowder

SHELLS OF FORAMINIFERA VARY IN SIZE AND FORM

These are average representatives, illustrating neither the largest nor the smallest members of the group. For the benefit of technical readers, the specific names, reading from left to right, are: Top row—*Bolivina dilatata, Virgulina schreibersiana, Bulimina fusiformis.* Middle row—*Rotalia calcar, Cassidulina laevigata, Pulvinulina menardi.* Bottom row—*Polystomella crispa, Spiroloculina limbata, Peneroplis planatus.* Enlarged 34 diameters.

up, will again carry on reproduction by division in the manner first described.

When we turn to the microscopic plants of the sea, we find that here, too, Nature has been lavish in bestowing her charms. Now the vegetation of the sea exists in far greater quantities than would appear to the casual observer of seaweeds along the shore. There are also stupendous numbers of plants, nearly all microscopic, that float free in the sea.

These small floating forms, with extremely rare exceptions, are the only kinds of vegetal life found in the open ocean. And here is a curious thing: unlike the plants of the land, wherein green is the predominant color, these of the open sea are of various hues, but the great majority are brown; very few are green.

Yet whatever attractiveness they may lack in their coloring is more than compensated for by their exquisite and marvelous structures. A case in point is the Diatom (see Color Plate III). The form of this plant is quite variable. It may be disklike, or boat-shaped, or one of a dozen other patterns. It has a shell of silica which is made of two halves that fit together like the top and bottom of a pillbox. The plant lives within the shell. But what a wonderful shell!

The regular and geometrical arrangement of the embossing of these pretty patterns is nowhere else duplicated in Nature.

THE BLACK HILLS, ONCE HUNTING GROUNDS OF THE RED MEN

IN ALL but name, the Black Hills of South Dakota are more than hills. They rise higher than either the Appalachian or the Ozark Mountains, and Harney Peak, their loftiest mass, is the highest point between the Rockies and the Atlantic Ocean.

They form a veritable island of mountains in the Great Plains, and the natural attractiveness of their heavily wooded peaks and ridges and their well-watered valleys is made doubly appealing by the contrast of the surrounding country.

Touching the hills on the southeast is one of the most desolate yet interesting areas in America, the Big Bad Lands of southwestern South Dakota, where, through thousands of years, rains have carved the light clays and sands into fluted columns and cones, jagged buttresses, and a thousand other fantastic forms (see illustration, page 313).

THE "LITTLE ROCKIES" OF THE WEST

The Black Hills are not a part of the Rockies, but they may be looked upon geologically as dwarf brothers to those giant mountains, showing the family characteristics on a smaller scale.

Both probably were formed about the same time. Data assembled by geologists show that millions of years ago, during the Mesozoic Age, a vast sea washed over the entire central portion of the continent, covering the site of the Black Hills. It was at this time that the softer rocks of the region were formed as sediments. When, at the end of the Mesozoic, the great flow of melted granite welled up from below to raise the Rockies, it found a weak spot at the site of the Black Hills and rose there, too, poking the surface limestones and other rocks up as a rising tent-pole pushes up the canvas.

The cooking process which the surface rocks underwent at that time had much to do with making the Black Hills one of the richest mineral regions in the country.

In the ages since these mountains rose, the softer stones have been weathered away in many places, exposing the hard granite, as at Harney Peak. Around the base of this peak stand great spires, remnants of the softer rock, which constitute The Needles, one of the most striking bits of scenery in the region (see, also, text, page 323).

The Black Hills derived their name from the blue-black appearance of the dense pine forests when viewed from a distance.

They played a peculiar and interesting part in the frontier life of America. Before the coming of the white man these wooded uplands were one of the favorite hunting grounds of the Indians of the surrounding Plains. They were unsettled by whites long after emigrants had established themselves in California, Texas, Colorado, Utah, and other territories farther west. This was because all of western South Dakota was reserved for the Sioux Indians.

For generations this region of hills and trees and streams, off beyond the dry prairies, had been a sort of legendary promised land to people of the near West, and more than one party of adventurous emigrants had dared everything in a dash toward it across the hostile Indian country. But most of these bold men fell victims to the avenging tomahawk.

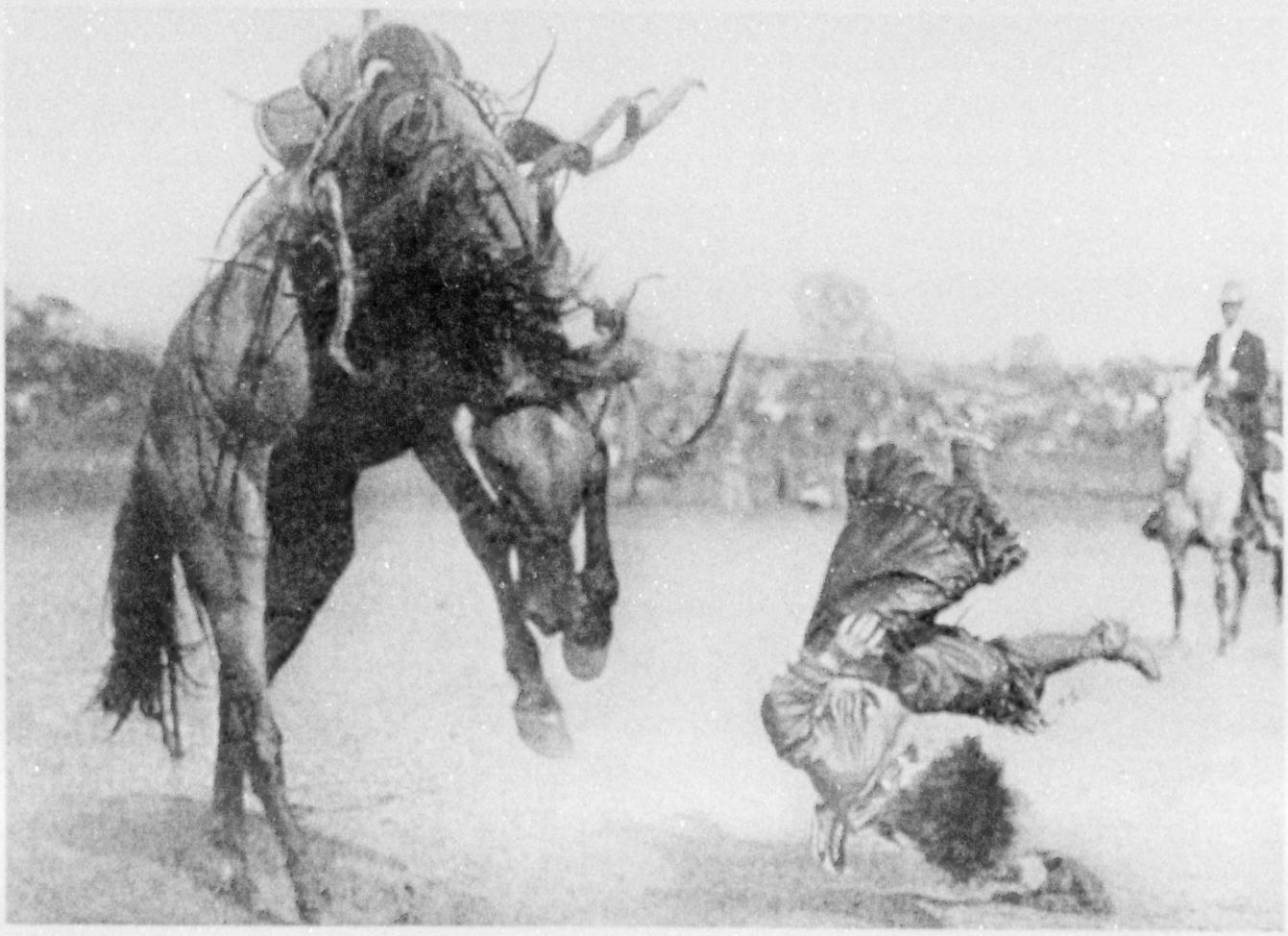
What Indian tribe possessed this choice hunting ground of the West before the white man came to America is unknown; but since the opening of the West several distinct tribes have occupied the region, each in turn forced out by a stronger group. In all cases these newcomers have appeared from the east and almost without exception the older residents have moved farther west. Doubtless this parade of tribes through the Black Hills has been going on for many hundreds of years.

INDIAN TRIBES INVADE BLACK HILLS

The Crow Indians are believed to have been in possession of the Black Hills near the beginning of the eighteenth century. Later the Poncas entered the eastern portion of the highlands, but, finding them occupied, turned back eastward. The Cheyennes were the next successful invaders from the east, and were in possession of the territory when Lewis and Clark passed in 1804.

Next came the Sioux, the last of the red

PRESIDENT COOLIDGE GREETS MEMBERS OF AMERICA'S "FIRST FAMILIES"



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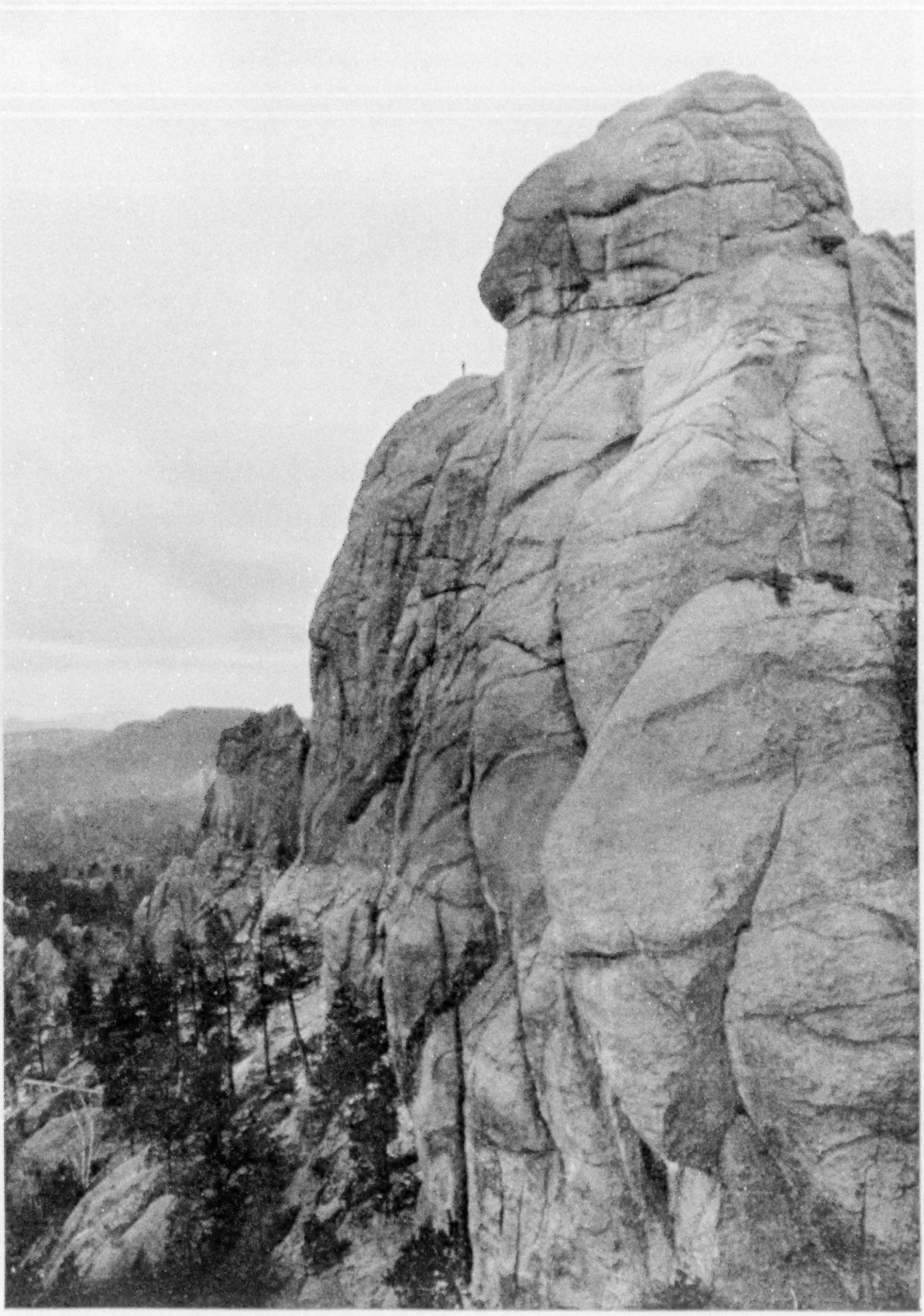
BRONCHO "BUSTING" HAS ITS SPILLS



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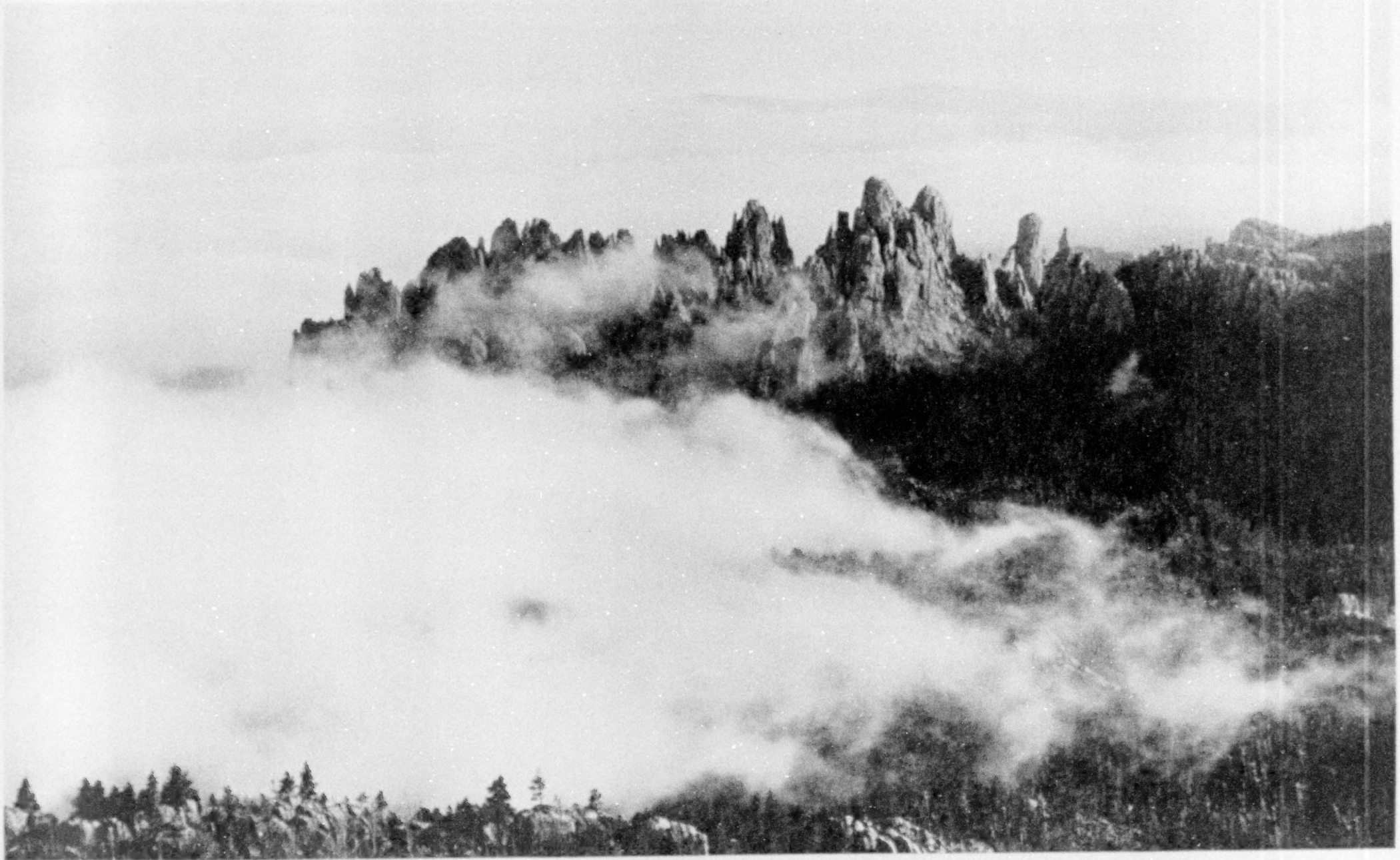
RUSHMORE MOUNTAIN'S GIGANTIC CLIFFS DWARF MAN AND TREES

In preparation for the carving of its huge figures, Rushmore Mountain was dedicated in October, 1925. Over it were raised, in turn, the flag of old France, the flag of Spain, the present French Tricolor, the American Colonial flag, and the Stars and Stripes of to-day. All the sovereignties represented by the banners have held sway over this region (see, also, page 327).



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CATHEDRAL SPIRES FROM THE TOP OF HARNEY PEAK

When clouds screen the softening forests below and leave only these sharp crags exposed, Nature seems to snarl and show her fangs. The effect is heightened by the wicked whining of the wind among the pinnacles.

© Albert Schlechten

THE MODERN MANNA THAT IS COAXED FROM THE EARTH

Wheat enough for countless thousands of loaves. These shocks represent the harvest of spring wheat from the rolling grain lands of Montana, 16 miles west of Bozeman.

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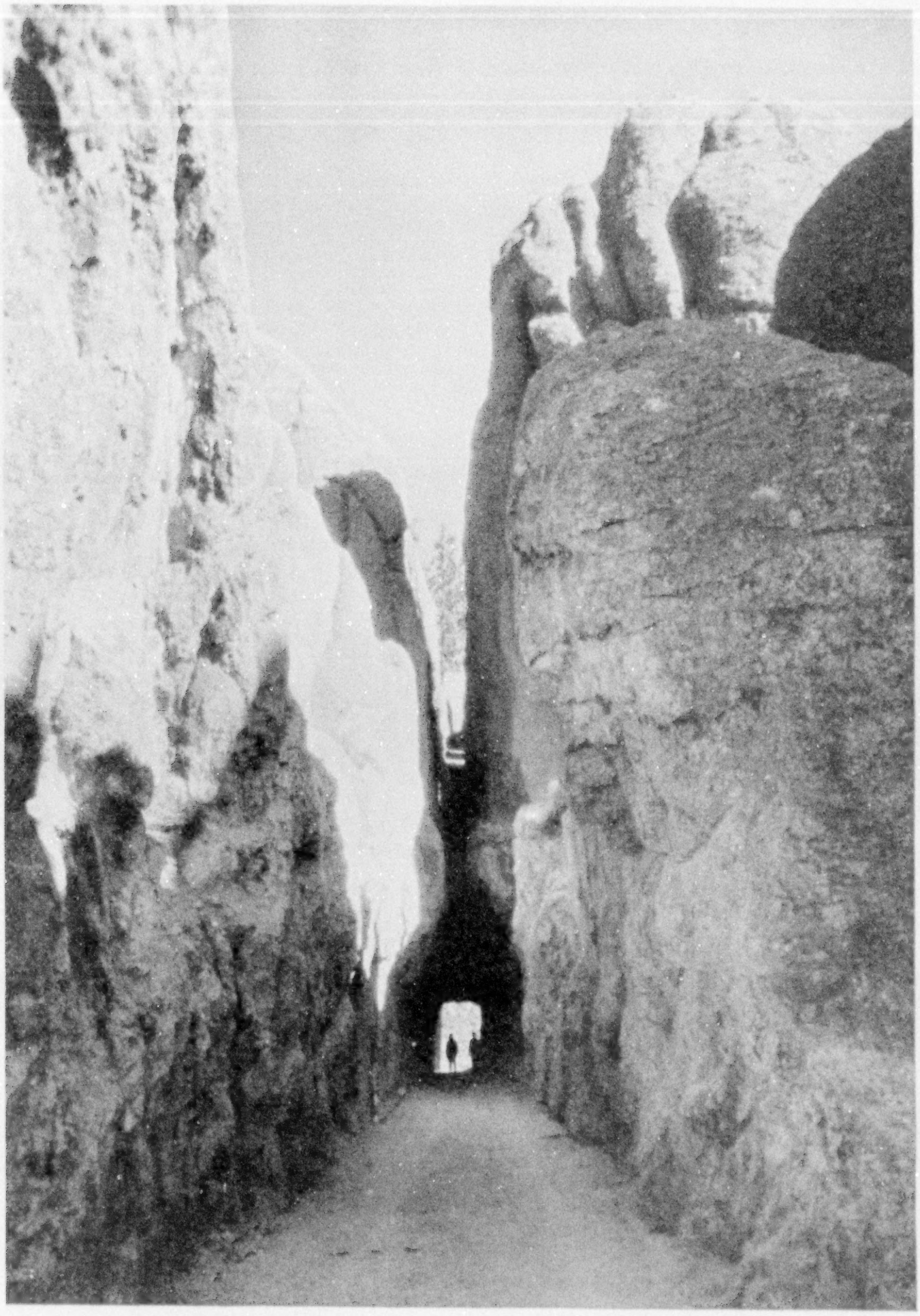
AN AMERICAN SPHINX FASHIONED BY NATURE

Sphinx Rock lies at the base of Rushmore Mountain. Like most of the striking rock formations in the Black Hills region, it is the product of erosion. Note the figure of a man (left center) (see text, page 305).



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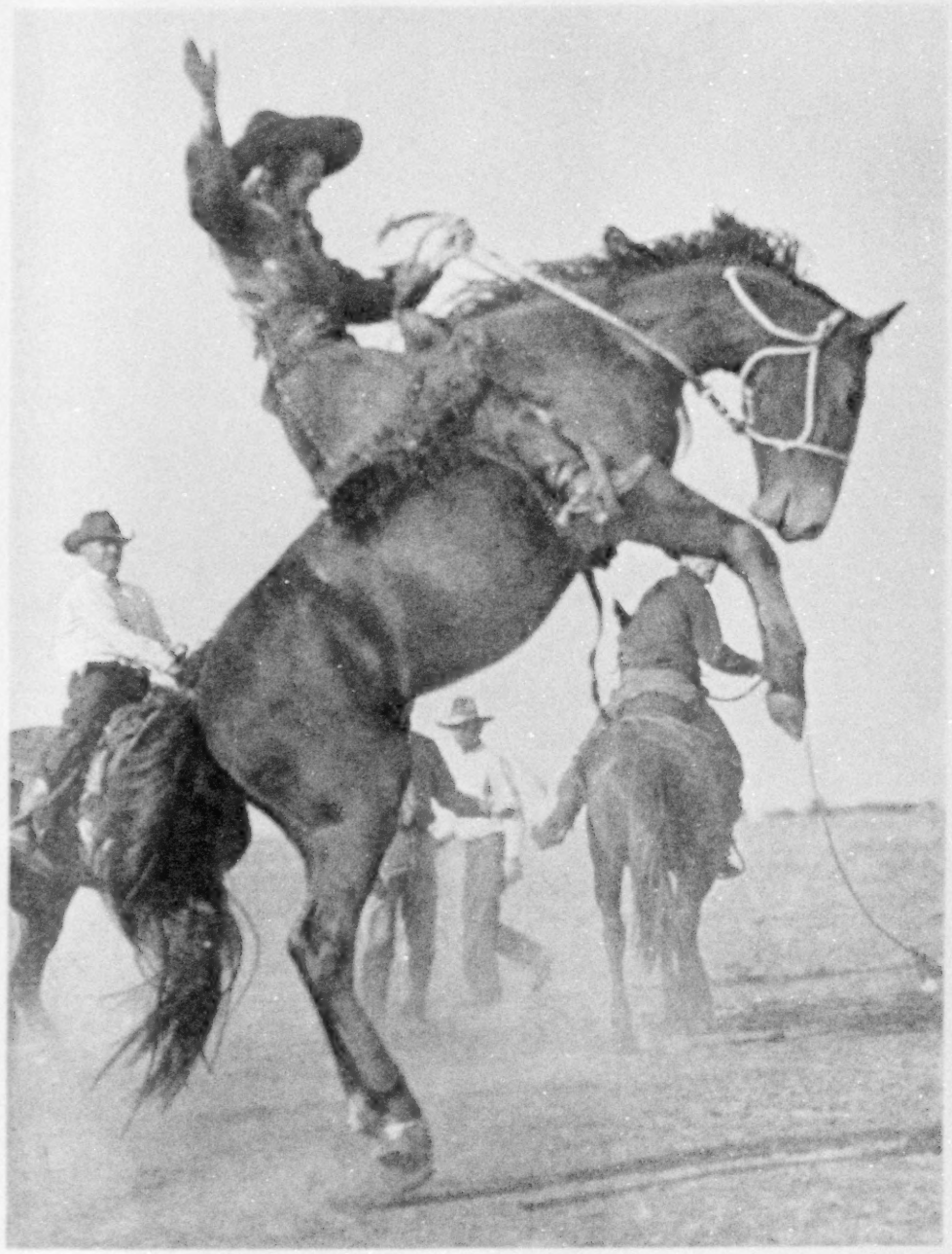
CUSTER PARK'S GREATEST SCENIC ASSET

The Needles Road through the jagged wonderland near the base of Harney Peak discloses the park's most striking scenery. Sections of this highway pass between walls of white limestone. At one place a tunnel has been cut to conduct the road through the rock.



BRONCHO BUSTING HAS ITS THRILLS

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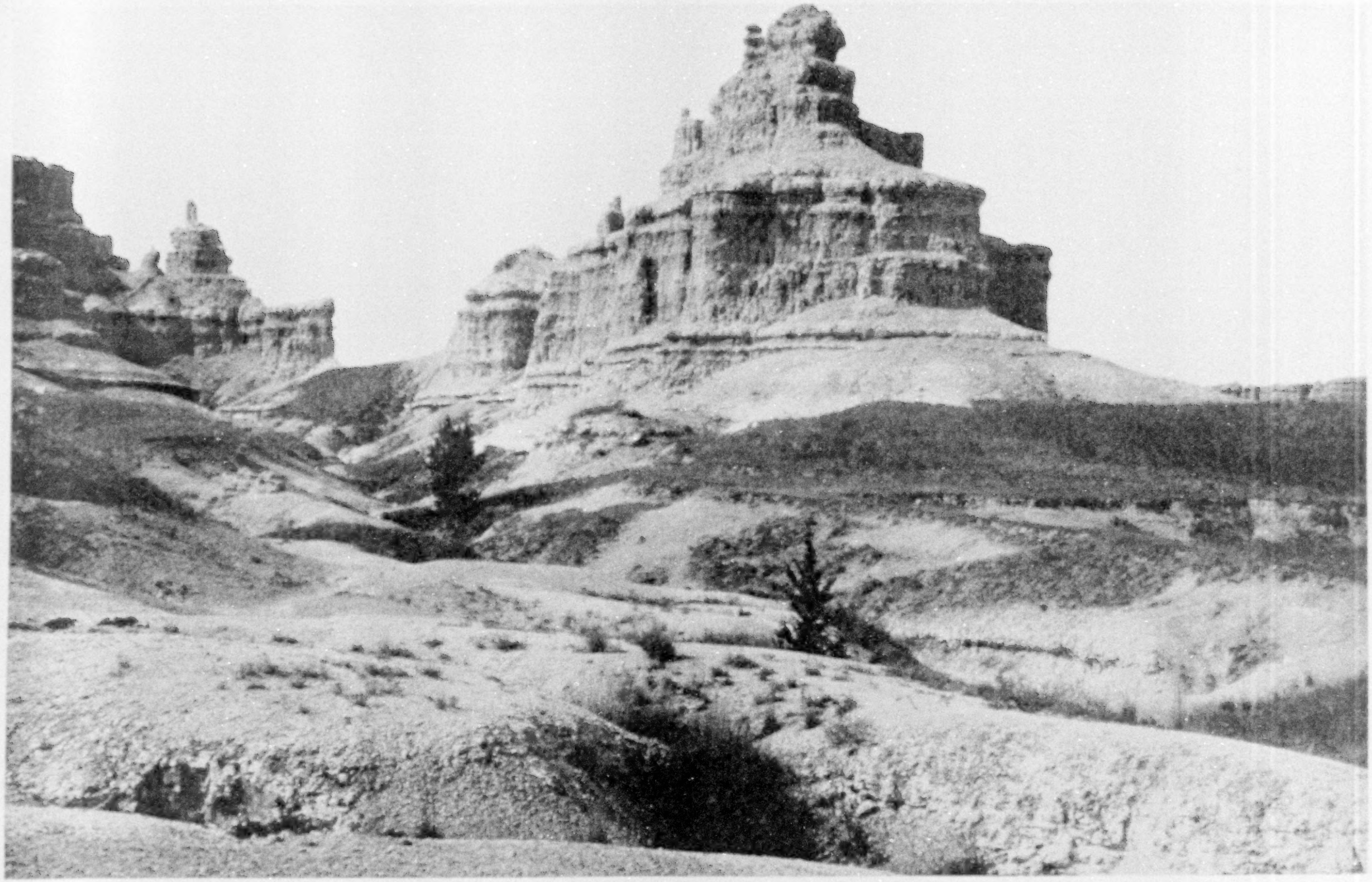
SITTING TIGHT THROUGH A HORSE-MADE EARTHQUAKE



© Rise Studio

NATURE A MASTER SCULPTOR

South Dakota's "Bad Lands" were covered by a great sea in fairly recent geologic time. In the water, sediments of clay and soft rocks were laid down. When the land rose above the sea, rain and winds attacked the soft deposits, and through hundreds of thousands of years have carved them into terraces, spires, castles, and hundreds of other weird forms. Tree growth is absent from most of this region. Its bare, inhospitable appearance accentuates by contrast the charms of the forest-covered, well-watered Black Hills, which it adjoins (see, also, text, page 328).

men to hold this desirable region before the advent of the whites.

The first "written" history of the country is a pictorial chronicle of the Sioux on prepared skins. It records that the famous chief, Standing Bull, led a party of warriors to the hills about the time of the American Declaration of Independence, and took back to his Plains home a little pine tree, a type of tree never seen before by his immediate tribe. It is a matter of tradition that the Cheyennes fought stubbornly to retain their upland hunting grounds, but that the Sioux finally drove them out, the decisive battle being fought at Battle Mountain near the present town of Hot Springs.

EARLY IMMIGRANTS ELUDE THE BORDER PATROLS

It was while the Black Hills were under the control of the Sioux that the contacts of white men with the country became more numerous. These were fleeting at first. Fur-trading posts were established not far from the hills in the early nineteenth century, but only occasionally did any of the traders at these stations gain glimpses of the hill country.

The United States Government forbade immigrants to go into either the Plains country or the hills so long as these territories were recognized as belonging to the Indians; but from time to time a few individuals and small parties eluded the border patrols and struck out for the fabled hills. Some actually reached the goal, it was found later, but only to pay for their daring with their lives.

Probably the first whites to see the Black Hills were two Frenchmen, Louis-Joseph Verendrye and his brother, Francis Verendrye, who wandered west with a party of Indians in 1743. They entered the hills and claimed them for the King of France. Lewis and Clark, in 1804, heard of the mountain country, but did not enter it; and it was also passed without exploration by a party of fur traders in 1811 and by Bonneville in 1831. Father De Smet, a missionary, was with the Indians in the Black Hills in 1848 and succeeding years.

The era of military exploration of the hill country was opened by General W. S. Harney, for whom the highest of the region's peaks is named. He skirted the southern end of the highlands in 1855. The first real exploration, however, was carried out by officers of the U. S. Army in 1857 and 1859. After these expeditions rumors of the existence of gold in the Black Hills spread throughout the nation, and a horde of would-be prospectors insisted that they be permitted to seek their fortunes in the new El Dorado.

In 1874 the Secretary of War sent an expedition to the region and its mineralogists discovered gold. When this became known, prospectors entered, in spite of the best efforts of the United States Army. After a year or two of unsuccessful attempts to eject these white interlopers, the Federal Government found it necessary to purchase the hills from the Indians.

Altogether more than $40,000,000 has been spent by the Federal Government on behalf of the Sioux as a result of their relinquishment of the Black Hills.

The national acquisition of this land was not easy. Not only were the Black Hills a favorite hunting ground, but certain areas were regarded as sacred ground by the Sioux. There were places reserved for the Great Spirit, where no Indian dared hunt. To them came the medicine men to practice rites which should avert national disaster. It was in these hills that Sitting Bull communed with the spirits before he incited the Sioux to resist Crook and Custer in the memorable campaign in which the latter officer lost his life.

DEADWOOD'S MINING CAMP INSPIRED THE AMERICAN DIME NOVEL

The region was thrown open by President Grant in 1876, just 51 years ago. A frontier life of the most turbulent sort developed in the mining camps that sprang up, and Deadwood, the leading camp, became the inspiration for the American "dime novel," which came into being about that time.

All is changed now. Mining has been placed on a corporation and machine basis, and the once hectic mining camps have become quiet, prosperous little cities. The Homestake Mine at Lead is one of the largest in the world and has taken out gold valued at more than two hundred million dollars.

Despite the industrialization of gold mining, there still dwell in the heart of the

© National Geographic Society Natural Color Photograph by Edwin L. Wisherd

EACH OF THE GOLDEN-EAGLE PLUMES IN HIS HEADDRESS REPRESENTS A DEED OF VALOR

The brave acts thus recorded in feathers may have been those of the Crow himself or of his tribe, which occupies a reservation in Montana. Ermine pendants hang from the brim at each side of the face. His ceremonial tomahawk, with perforated blade and handle wrapped in otter skin, is of a type introduced into the Plains by the French. His little daughter prizes her costly dress adorned with milk teeth of the elk.

TELLING THE STORY OF CUSTER'S LAST STAND

When Yellow Hair, or Long Hair, as the Indians named Custer, rode to his disastrous encounter with the Sioux and their allies on the banks of the Little Horn, in June, 1876, several members of the friendly Crows served him as scouts (see, also, Color Plates XIV and XVI).

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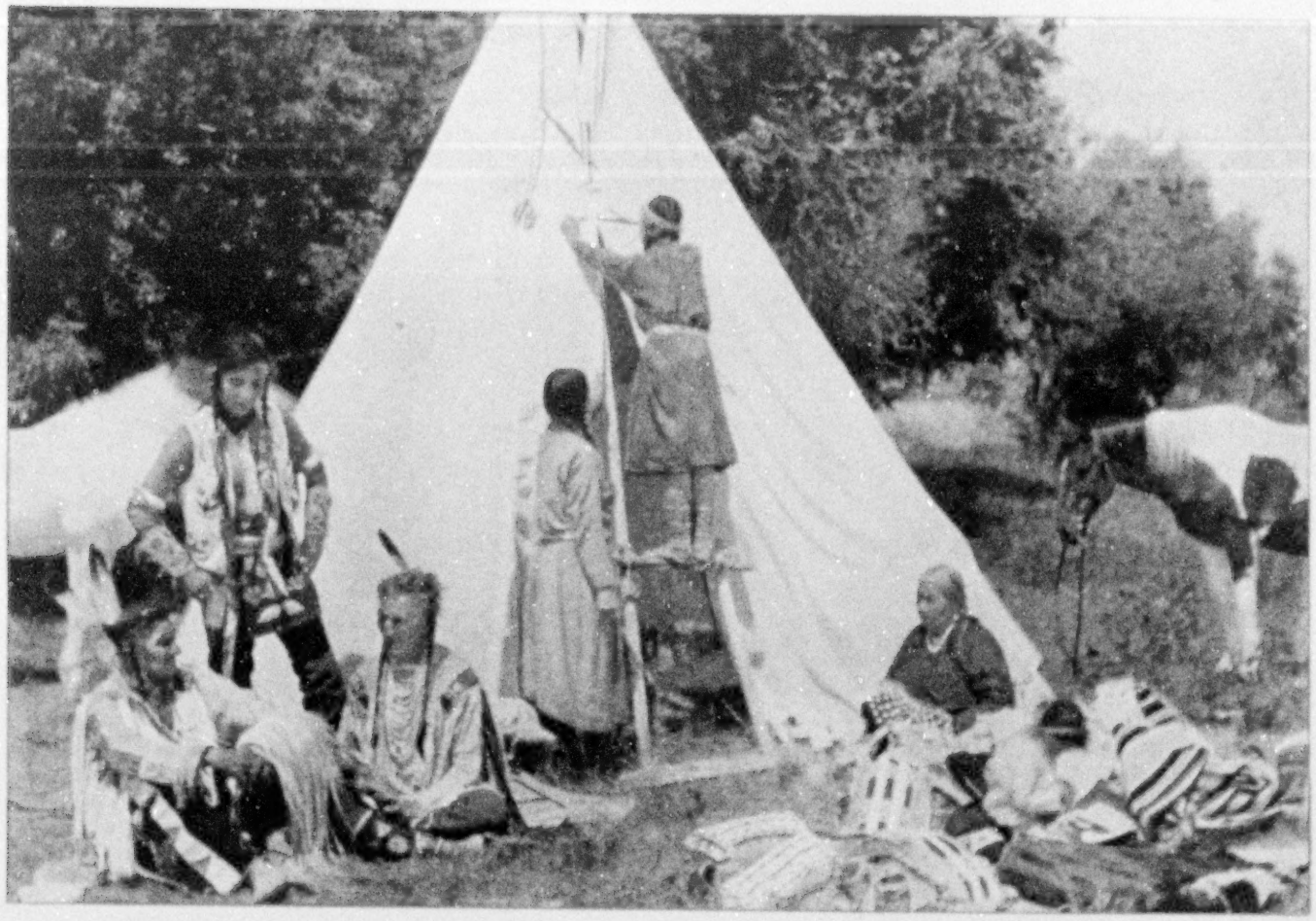
A LABOR OF LOVE FOR HER WARRIOR

Probably the best Indian beadwork to-day is produced by the Crows. Floral designs indicate missionary influence, for such patterns were never used by the early Indians. Beaded cushions are popular articles to-day. A Navaho rug and a cow skin, the latter a substitute for bison hide, flank the doorway.

THE FRIENDLY CROWS IN FESTIVE PANOPLY



SHE SKEWERS THE TEPEE TOGETHER WITH WOODEN PINS

Most of the Crows now live in small frame houses, but use an ordinary wall tent during summer visits to the mountains or at camps about fairs and race tracks. They pitch the tepee only on special occasions, usually during a fair or race meet of their own.

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SQUAWS BEAD WHILE THE BRAVES POWWOW

The lambrequin lining the Crow tepee was formerly of decorated skin, but has given place to calico of modern design. From the top hang leggings, pouches, and an elk-tooth dress (see, also, Color Plate IX). The young man (center) holds an eagle-feather fan (see, also, Color Plates XII, XIV, and XV).

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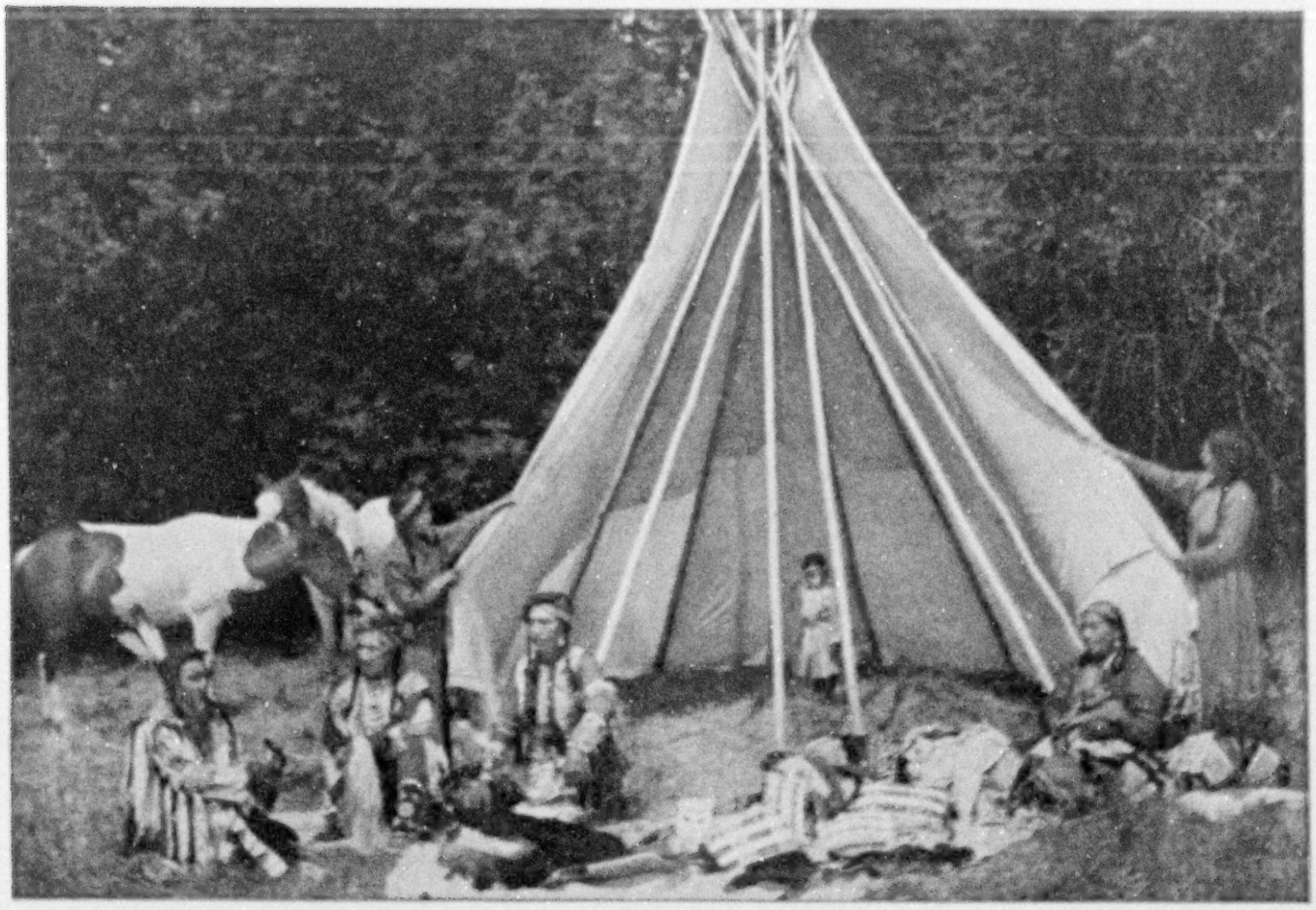
RED TOMAHAWK, THE NEMESIS OF SITTING BULL

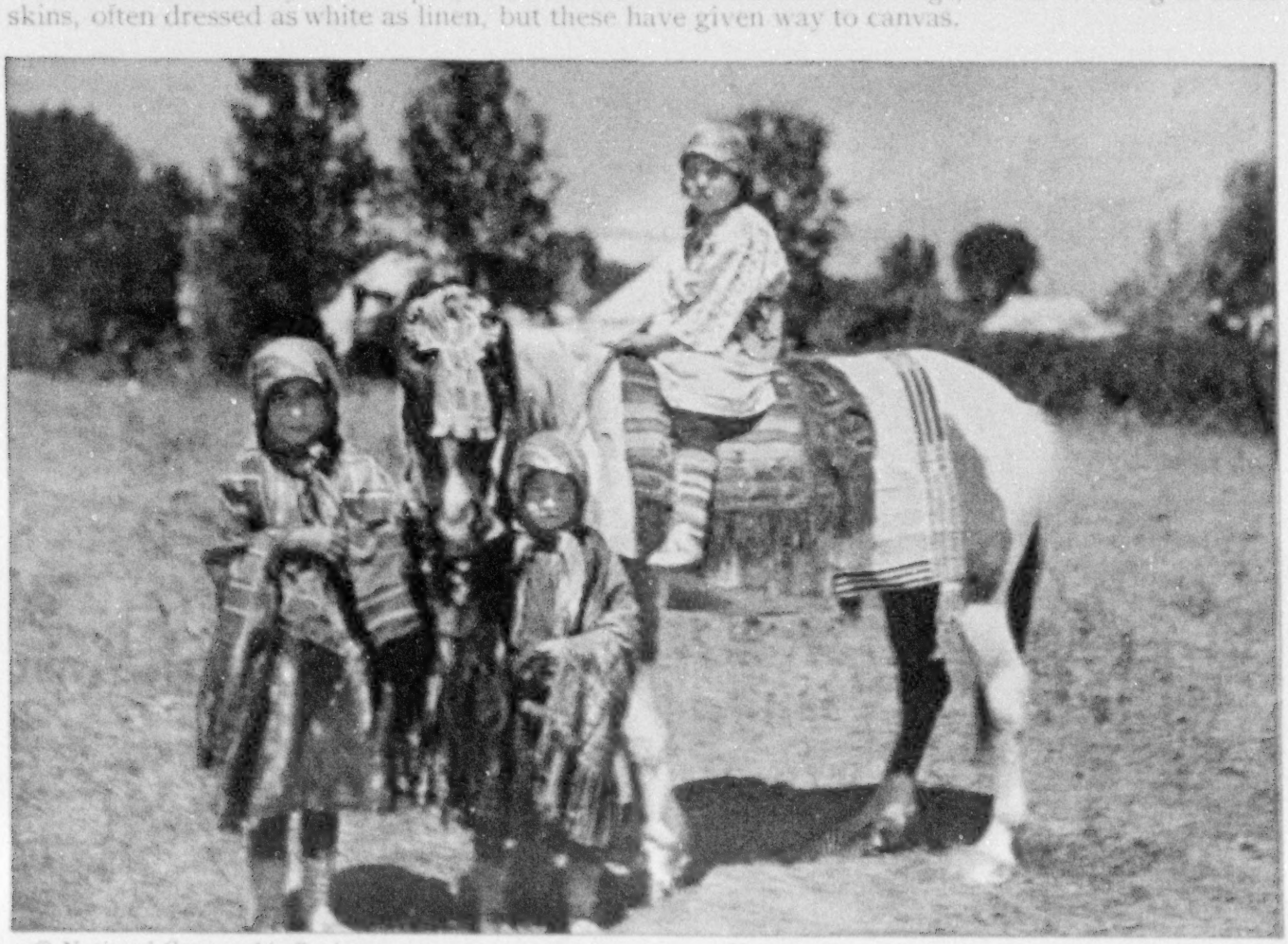
This Cheyenne River Sioux was rear guard of the Indian police who in 1890 arrested the leading figure in the famous battle commonly called the Custer Massacre. It was Red Tomahawk's shot which is believed to have killed instantly the notorious Sitting Bull, when he attempted to escape. The fan was formerly carried in the Sun Dance, no longer given in its old form.

THE FRIENDLY CROWS IN FESTIVE PANOPLY



PITCHING THE TEPEE IS WOMAN'S WORK

Sometimes there is merry rivalry between groups of squaws as to which can set up an abode the fastest. The early Crow tepee, most beautiful of the Plains dwellings, had a covering of bison skins, often dressed as white as linen, but these have given way to canvas.



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EVEN THE PINTO DRESSES UP FOR A HOLIDAY

He swaggers in beaded bridle pendant and saddle cloth. His little Crow owners have also donned their best regalia, a mixture of Indian and Paleface clothing. The headshawls, in particular, strike a false note to-day, for, except on ceremonial occasions, the early members of the tribe wore no head covering.

WHITE-MAN-RUNS-HIM SCOUTED FOR CUSTER

He was one of the Crows who first sighted the hostile Sioux camp at dawn on the day of the Little Horn battle, and was of material assistance to Long Hair (Custer). His clear recollections have proved valuable to military students of the battlefield.

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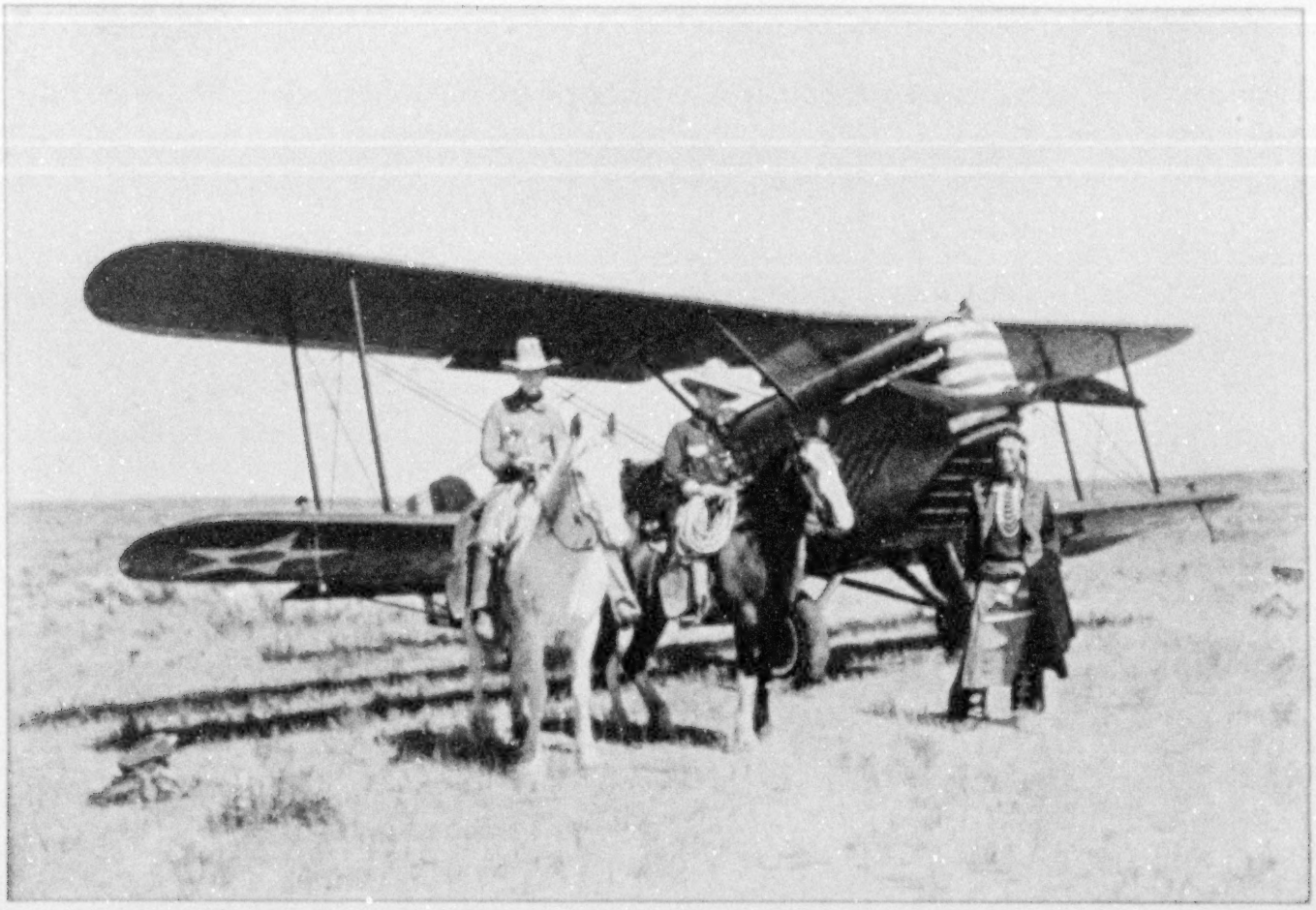
Natural Color Photographs by Edwin L. Wisherd

SOMETHING TO CROW ABOUT

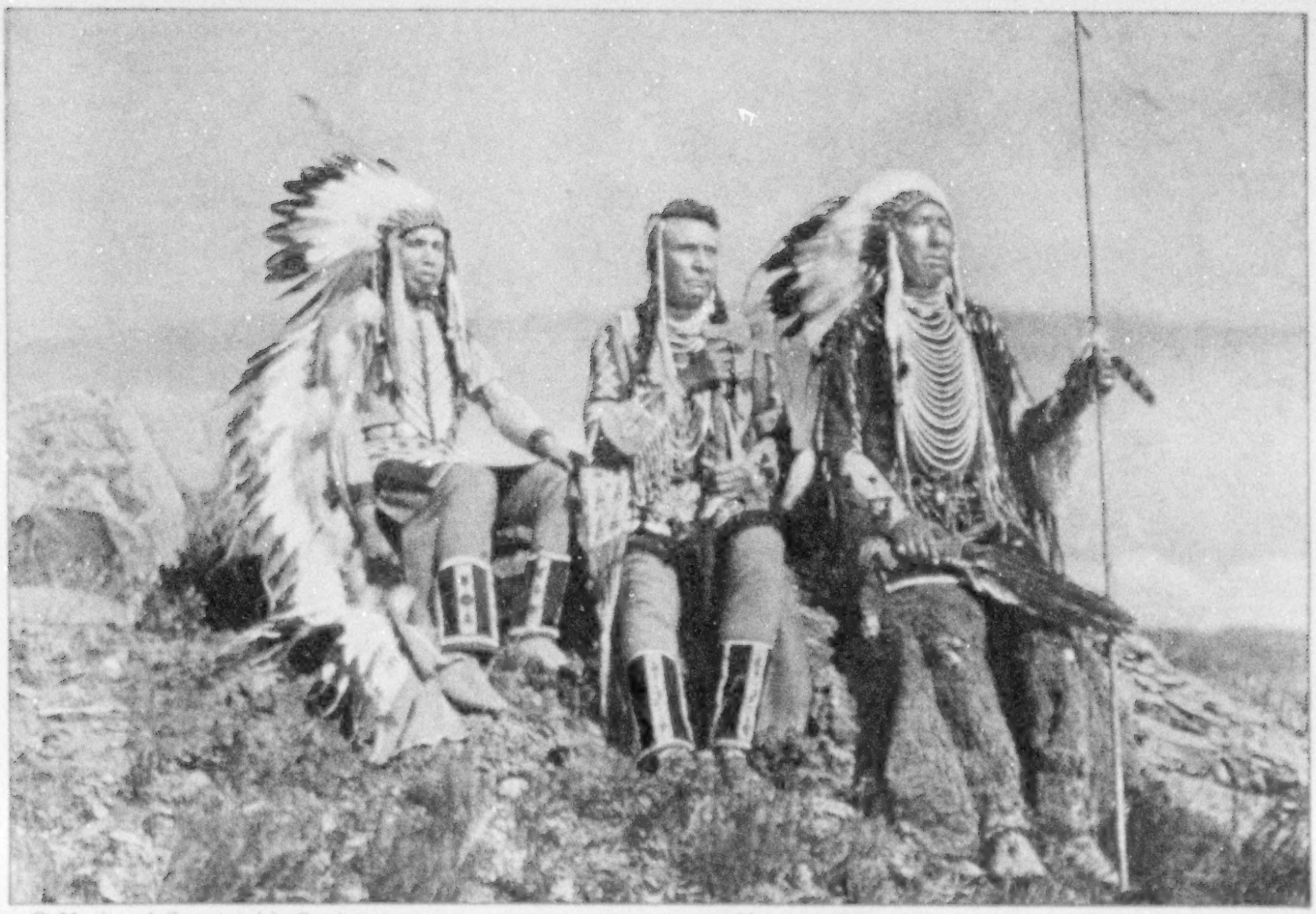
Crow children are not only apt scholars in the public schools, but potential recruits to Government club work for the improvement of farm life. Last year the 202 Crow boys and girls on the rolls captured 41 prizes at the county fair in competition with the whites.

THE FRIENDLY CROWS IN FESTIVE PANOPLY



"LET GRASS BE GREEN AGAIN AND HATRED CEASE"

In their struggle for the bison pastures against the white man, the Plains Indians "fought the fight they could not win." The brave of yesteryear has turned from warpath to plow, and to the trails of progress with his white brother, whose latest advance through the West is by airplane.



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THEY EXCHANGED WAR BONNETS FOR STEEL HELMETS

Approximately 12,000 Indians took up arms for the Great White Father in the World War. One of these Crow warriors wears chaps of bison hide. Long tubes of drilled bone form a kind of plastron or breastplate for the brave at the left; chains of bone disks content the others.

© National Geographic Society

Natural Color Photograph by Edwin L. Wisherd

WHERE THE WHITE CHIEF OF THE LONG HAIR MADE HIS LAST STAND

Fifty-one years ago warwhoops of the Red Man's greatest triumph over the Paleface resounded on the ridges of the Greasy Grass (Little Horn) River. Across these slopes 2,500 braves swirled and charged, sweeping Custer and his outnumbered command with a rain of fire. More than 200 of the 225 bluecoats of the Seventh Cavalry lie to-day where they fell, but their commanding officer's body was removed to West Point.

hills survivors of more primitive days. Still under the spell of the yellow metal they fare forth daily from their tiny log cabins in endless search.

THE BLACK HILLS ARE CUSTER COUNTRY

The Black Hills are Custer country as truly as is the Little Horn Valley, 200 miles farther west, where General Custer lost his life at the hands of the Sioux and their allies. It was Custer who led the official Government expedition to explore the Black Hills in 1874. In his honor the town of Custer, the first white settlement there, was named. The State park which has recently served as a presidential vacation ground also bears the name of Custer.

The great Indian uprising of 1873-76, under Sitting Bull, which led to the Custer massacre, resulted from trouble between the whites and Indians over the opening of the Black Hills. Some of the ancestors of the Indians shown in the color pictures in this number of the NATIONAL GEOGRAPHIC MAGAZINE took part on one side or the other in this uprising.

A large part of the Black Hills is covered by two adjacent national forests, Harney and Black Hills Forests. Custer State Park, one of our 529 splendid State Park areas throughout the Nation, is almost entirely surrounded by these reservations. The park extends from near the southeastern edge of the Black Hills westward about eight miles toward the town of Custer and northwestward to include Harney Peak and Sylvan Lake. The peak has an altitude of 7,242 feet. Sylvan Lake covers 40 acres and lies at an altitude of approximately a mile and a quarter (see illustration, page 325).

NEEDLES RESEMBLE THE DOLOMITES

Game Lodge, the State-owned hotel in which President Coolidge spent his vacation, is situated a few miles from the eastern edge of the park, in a valley among the lower hills. Its altitude is approximately 4,000 feet.

Near by is a highway recently built through the Park from east to west and extending to Custer, 15 miles to the westward. About ten miles west of Game Lodge a highway branches off to Sylvan Lake, leading through the remarkable Needles. These, in the jagged forms they have taken, are not unlike small models of the world-famous Dolomites of northern Italy (see, also, illustration, page 328). All about are wooded hills and peaks, and through them wind numerous streams stocked with trout.

Almost as interesting as the shady, inviting Black Hills, are the sun-drenched, water-gashed Bad Lands that adjoin them. Their most picturesque portion lies between the Cheyenne River and the White River to the southeast of the hill country. From a great blanket of mud and soft rock laid down in a prehistoric sea, the rains and winds of myriads of years have carved innumerable weird and fantastic forms. Great turrets and castles and terraces rise on every hand, and only a little help is needed from the beholder's imagination to create, in the twilight, great walls and temples and cities (see illustration, page 313).

BAD LANDS FORM FOSSIL MUSEUM

The forces of erosion have done more than carve scenic wonders from these Tertiary clays and sands. When the deposits were washed into place millions of years ago the bodies of countless animals and fishes were covered. The site of the Bad Lands became a huge graveyard; and as the old deposits have been carved away by water and wind in recent centuries, the bodies of these ancient forbears of the animal world have been brought to light. As early as 1850, when hostile Indians held possession of the region west of the Missouri River, scientists, learning of these fossils, began their expeditions to the Bad Lands. In the years since that time the territory has come to be recognized as one of the richest storehouses of ancient animal life to be found in the world.

Specimens of bones and complete skeletons from the Big Bad Lands have found their way into museums all over the world. One of the best collections is maintained close to the beds at the South Dakota School of Mines Museum at Rapid City. Among the animals represented are crocodiles, rhinoceroses, three-toed horses (ancestors of the horse of to-day), oreodons, saber-toothed tigers, deer, camels, small rodents, and numerous other creatures, in-

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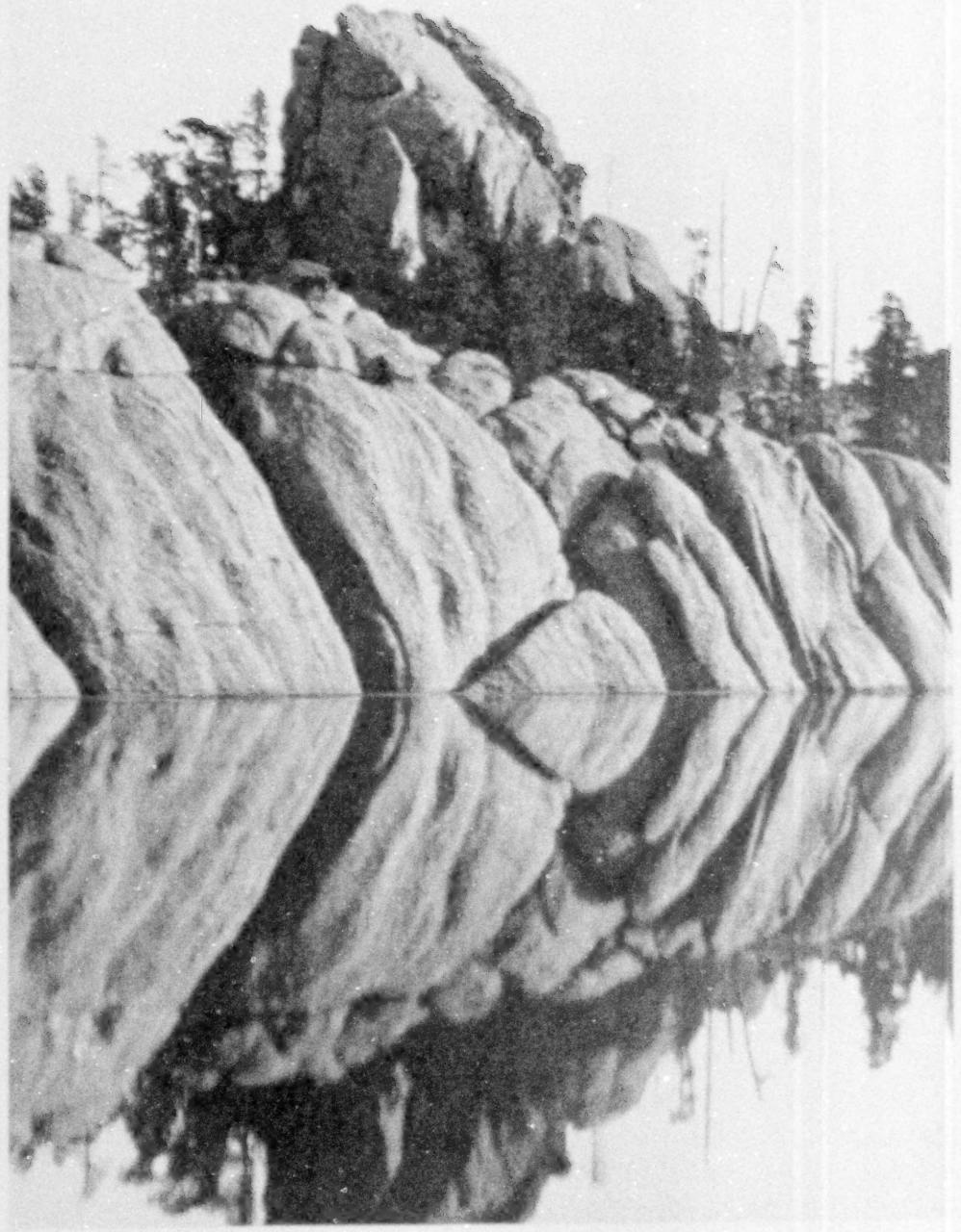
MOUNTAINS IN A LAND OF PLAINS

The Black Hills form an island of mountains in the vast expanse of the Great Plains and prairies of the West. They are not a part of the Rockies, but their scenery is in many ways similar to that of the greater mountains, which lie 200 miles farther west. The major peaks are bare, while the lesser heights are covered with a heavy growth of pines. The dark appearance of these highlands from the Plains gave them their name. The illustration shows a view westward from Harney Peak in the late afternoon, with rough peaks rising above a sea of clouds.

Photograph by Edwin L. Wisherd

A PRAYER FOR RACIAL PEACE

White-Man-Runs-Him is a Crow brave who served as a scout for Custer (see, also, Color Plate XIV). Here, on top of Reno Hill, on the Crow Reservation of Montana, he prays for everlasting peace between the Red and White man. Beside him stands General E. S. Godfrey, who campaigned under Custer against the Indians.



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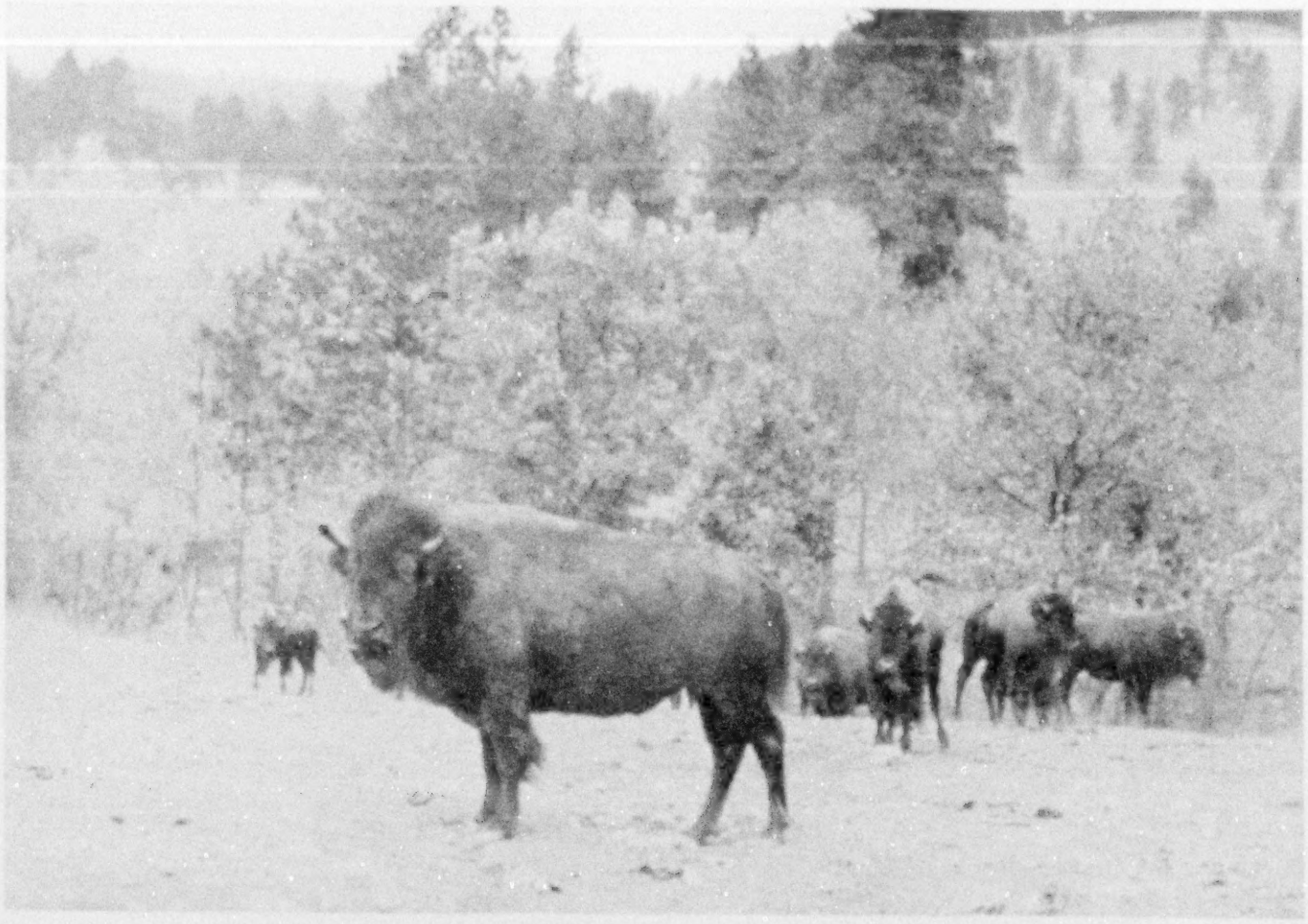
REFLECTION CREATES A DEMON

One must look sidewise at this rugged bank of Sylvan Lake and its counterpart in the smooth water to see the "Rock Demon." Turn the picture horizontally, then vertically. Sylvan Lake, at an altitude of a mile and a quarter, near the base of Harney Peak, is one of the major scenic features of Custer State Park.

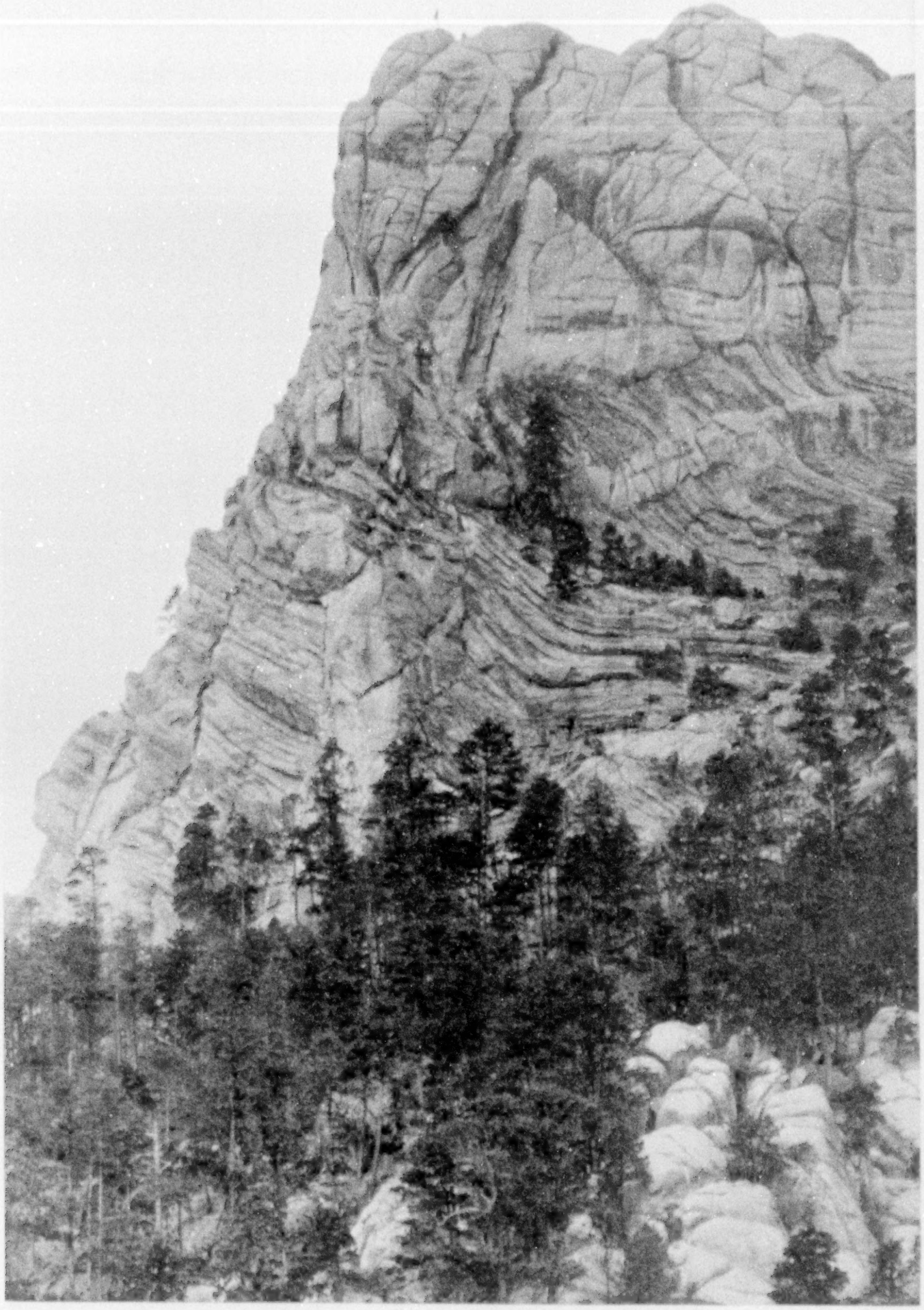


THE RED MAN HAS GONE, BUT A REMNANT OF HIS GAME REMAINS

Photographs from Rise Studio

WILD DEER IN SOUTH DAKOTA'S STATE GAME PARK

An area near the State Game Lodge, occupied by President Coolidge, was turned over to the State by Congress as the Custer State Park Game Sanctuary. The National Conference on State Parks is doing much to preserve deer, buffalo, elk, and mountain sheep in these parks.



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A FACE OF RUSHMORE MOUNTAIN: LIKE PAPER CRUMPLED BY THE HAND OF NATURE

On one of the surfaces of this huge cliff will be carved gigantic figures of four great builders of the American Nation: Washington, Jefferson, Lincoln, and Roosevelt. The figures will be 200 feet high and in full relief (see, also, illustration, page 307).

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THE NEEDLES: STONE SENTINELS IN CUSTER STATE PARK

These jagged pinnacles of limestone, with sturdy, dark pines fringing their bases, seem from a distance like small models of the world-famous Dolomites of northern Italy. They sweep in a curve around the base of granite Harney Peak, thus disclosing their origin (see page 323).

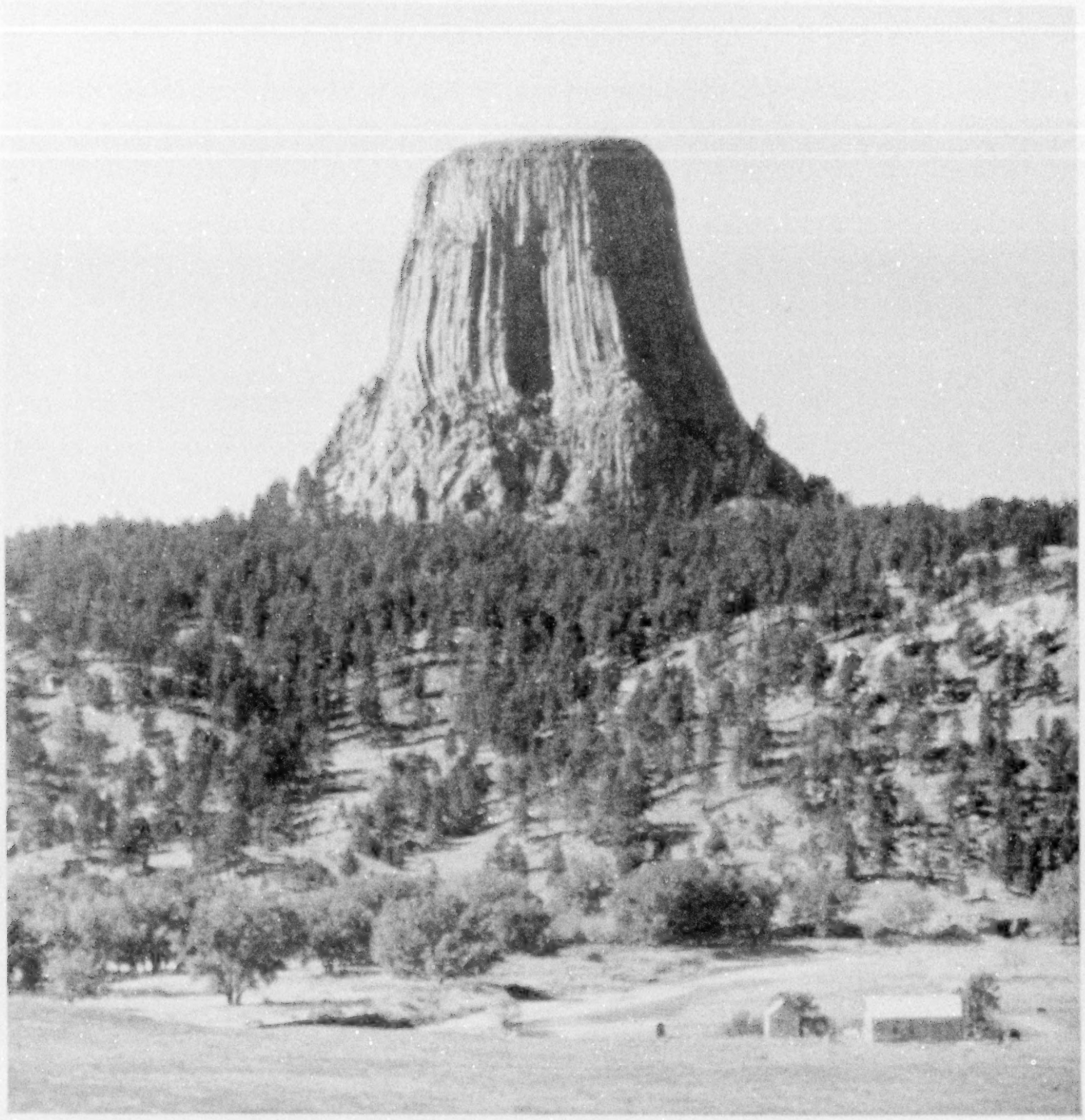
cluding a 13-foot fish. One of the most valuable specimens is the skull of a huge brontotherium, the largest animal found in the White River region. This creature, similar in appearance to a rhinoceros, reached the size of a full-grown elephant.

BAD LANDS DESERVE A BETTER NAME

The Bad Lands received their name from the Indians, who called them *Mako Sica*. The early French trappers translated this into *Mauvaises Terres;* and the first American immigrants, preserving the original idea, dubbed them "Bad Lands."

To the Indians, whose imagination peopled any region of unusual appearance with evil spirits, the name was natural, as it was to early travelers impressed with the difficulty of passage through the heavily eroded country. But to present-day lovers of the picturesque and magnificent in Nature, the name seems inept. For some years there has been a movement in South Dakota to save this unique scenic area by making it into a park, either under Federal or State protection, and there have even been suggestions that a more appropriate name be found. Many of the most striking formations are already reasonably accessible from the railroads and highways that strike westward to the Black Hills.

The Bad Lands have never been a totally



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DEVIL'S TOWER: A PROTRUDING RIB OF THE EARTH

This remarkable projection, in the Wyoming portion of the Black Hills country, is known to the Indians as Mato Tepee. It strikingly demonstrates Nature's methods in molding and reshaping the earth's surface (see text, page 305).

abandoned territory. The greater portion of the area is level and fertile and supports an excellent growth of grass. Thousands of cattle and horses have grazed in the region in the past, and in recent years farming and dairying have been carried on successfully in many sections. The discovery of good supplies of water through the sinking of shallow wells has done much to facilitate settlement. Close by regions once considered desolate infernos, homes have now been established.

One of the best vantage points from which to view the strange panorama which the Bad Lands presents is the cedar-covered top of Sheep Mountain. In one direction is a grassy flat with its browsing cattle. On all other sides Nature has crammed foreground and background with a jumble of weird but magnificent carvings. An outstanding feature is the Great Wall, all that is left of one level of the deep gravels and clays at which the forces of erosion have gnawed for ages. Flanking it is an intricate network of cliffs, domes, wedge slopes, and buttresses. Along the Wall itself rises an interminable series of towers and spires.

HE TOOK HIS OWN PICTURE IN THE MIDDLE OF THE NIGHT

Only the clouded leopard of Sumatra rivals the ocelot as the most beautifully ornamented of four-footed beasts. Against a smoky pearl background, the black markings develop from mere dots and speckles on feet and legs to the large, varishaped ocelli on flanks and back.

AN OCELOT FOLLOWING A TRAIL THROUGH THE JUNGLE

This most beautiful of the medium-sized cats is a nocturnal forest dweller that subsists largely on birds and monkeys. Although a few have been tamed, ocelots are not usually dependable in captivity. They revert too frequently for comfort to their primitive habits.

WHO TREADS OUR TRAILS?

A Camera Trapper Describes His Experiences on an Island in the Canal Zone, a Natural-History Laboratory in the American Tropics

By Frank M. Chapman

Curator of Birds, American Museum of Natural History

Author of "Over the Andes to Bogotá," "A Naturalist's Journey Around Vera Cruz and Tampico," etc., in the National Geographic Magazine

With Illustrations from Photographs by the Author

IF THERE be any sport in which the joys of anticipation are more prolonged, the pleasures of realization more enduring, than that of camera trapping in the Tropics I have yet to find it! From the moment when, after consideration of all the possibilities, you select a place in which to set your trap until the developments of the dark room show you what you have, or have not, captured, imagination keeps pace with expectation.

The result is often complete disappointment. But it may bring such elation that, so narrow is the boundary line between the manifestations of uncontrolled enthusiasm and dementia, it is safe to give full expression to your feelings only when you are alone!

It is well, also, to temper your exultation when in the presence of a big-game hunter. He tells of hardship in the pursuit of his prey and of more or less risk to life and limb in the killing of it. But I am usually asleep when my game is "bagged" and desire to kill nothing. Yet, so far as personal danger is concerned, I expect to blow my head off every time I set a camera. Furthermore, the rifle bearer may be reminded that, armed only with a field glass, I invade the haunts of large predatory mammals which are so aggressive that on Barro Colorado Island we have yet to see them!

BARRO COLORADO ISLAND IS A NATURAL TROPICAL LABORATORY

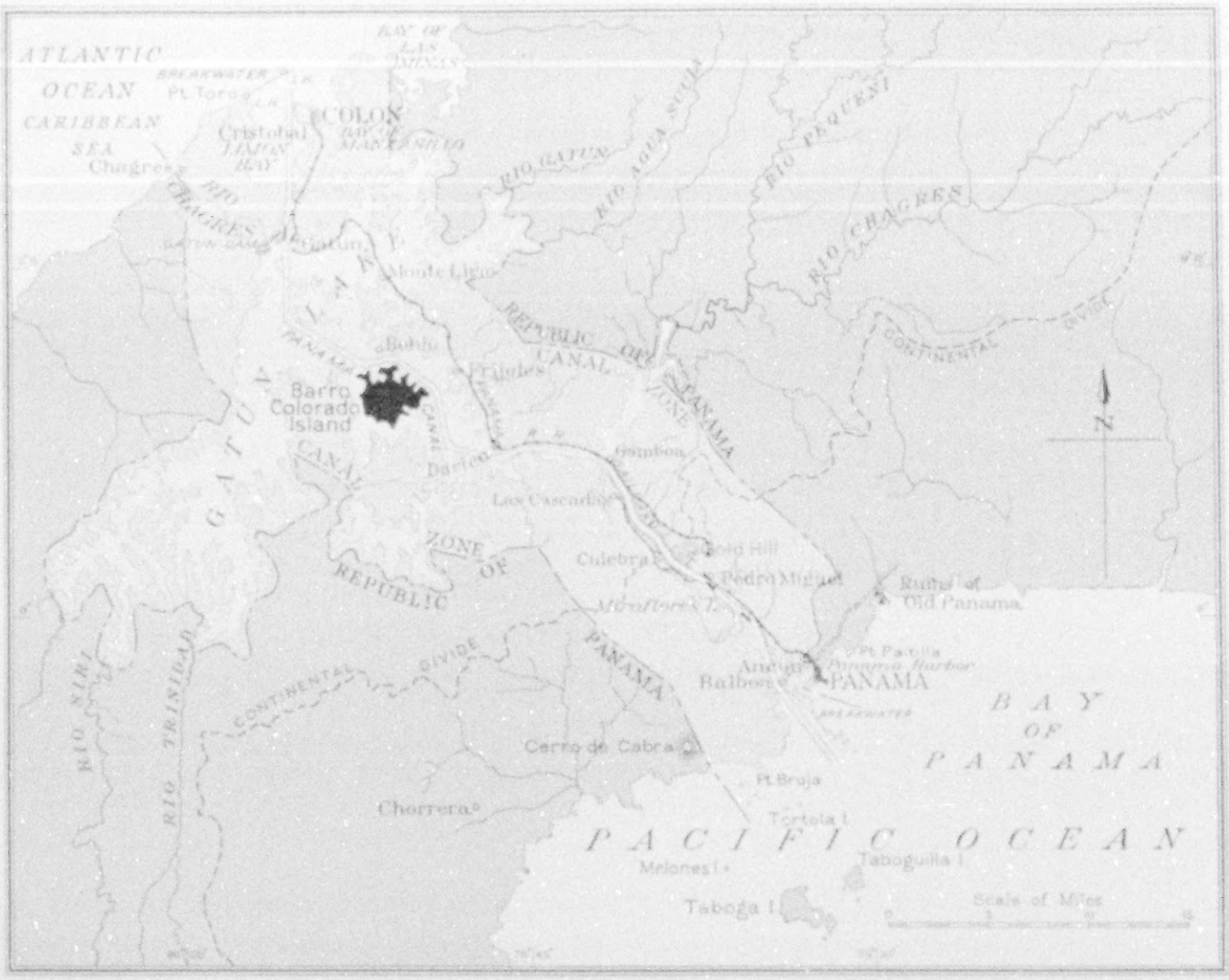
But whatever the decision as to ways and means, final judgment in the case of camera *v.* rifle will be based on results. So herewith I submit my winter's bag, together with a brief description of the place in which it was made, certain details in regard to the manner in which it was secured, and such further comments as seem desirable.

Barro Colorado is an island of about six square miles in area in the Canal Zone. With many others it was created by the closing of Gatun Dam and the subsequent overflow of 165 square miles of lowlands. Its summit is 537 feet above the sea, 452 feet above the lake. With the exception of a few acres, it is densely forested. Thanks to the enthusiasm and foresightedness of a number of naturalists and the support of a sympathetic administration, it has been set aside by our Government as a sanctuary for the conservation and study of tropical life.

The fact that the Canal Zone is the only bit of continental Tropics under our flag, and that Barro Colorado is the largest as well as the most nearly primitive island in the Zone, show clearly that it is an area of exceptional value.

The preservation and use of this natural laboratory have been entrusted to the Institute for Research in Tropical America. This organization, which is supported by small annual payments from several colleges and museums, students' fees and private contributions, has erected several buildings which afford naturalists comfortable living quarters and facilities for the pursuit of their investigations.

Its first aim is the preservation of natural conditions. The ground has been cleared only around the laboratory. About ten miles of trails have been cut, but without the loss of a single large tree. One may examine the accompanying airplane photographs, which clearly show the roof



Drawn by James M. Darley

BARRO COLORADO IS THE LARGEST ISLAND IN THE CANAL ZONE (SEE PAGE 331)

of the forest, without detecting any evidence of the paths that permit of easy and noiseless passage through the dense growth below (see illustrations, pages 334 and 335).

These trails have not brought with them the devastation that usually follows the path of man. The neighboring mainland contains far wilder-looking ways, but they have been traveled for centuries. Animals large enough to rank as game have long since disappeared from or become rare near them. But our trails were made for purposes of observation, not destruction, and it is improbable that they have in any way interfered with the natural life of the island. On the other hand, they have greatly facilitated the observation of it (see page 336).

Who treads these trails with us? The sudden rush through the undergrowth or the half-seen figures may be only coatis; the startling call of alarm may be only an agouti's, but it is the thought of the potential jaguar or puma which springs to mind when one hears these smaller animals. In spite of their assumed presence, these, and some other large mammals, have never been definitely recorded from the island.

How could we establish the fact of their residence? We might use dogs and the methods of the chase; we might employ skilled trappers; we might even resort to poisoned bait. But the motto of Barro Colorado is "Live and let live." We want a census of the living, not a record of the dead. How then could we make it? The answer is, by that type of autophotography with which George Shiras, 3d.*

* See, also, the following articles, and others, by George Shiras, 3d, in the NATIONAL GEOGRAPHIC MAGAZINE: "Nature's Transformation at Panama: Remarkable Changes in Faunal and Physical Conditions in the Gatun Lake Region," August, 1915; "Photographing Wild Game with Flashlight and Camera," July, 1906; "Camps and Cruises of an Ornithologist," May, 1909; "Wild Animals That Took Their Own Pictures by Day and by Night," July, 1913; "The Wild Life of Lake Superior, Past and Present: The Habits of Deer, Moose, Wolves, Beavers, Muskrats, Trout, and Feathered Wood-Folk Studied with Camera and Flashlight," August, 1921; etc.

THIS IS THE "GUN" THAT "BAGGED" THE TROPHIES

The cups holding the magnesium powder, at each side of the camera, are connected by wires, and the trip-wire runs to a battery beneath the cup at the right (see text, page 337).

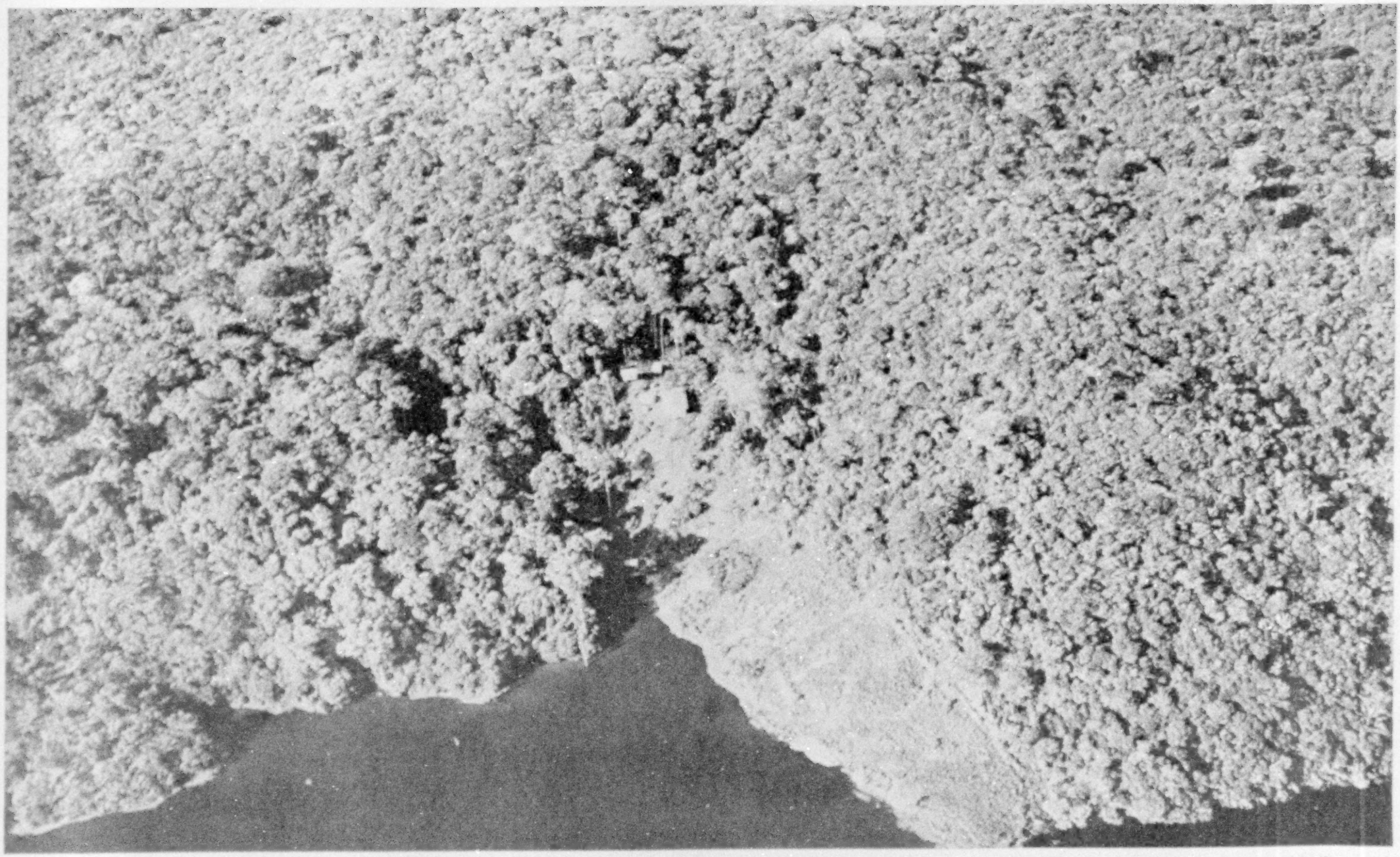
THE FLASH CAMERA IS NO RESPECTER OF PERSONS

In crossing the wire a visitor to the island focused his attention so intently upon his feet that he failed to raise his staff, which touched the wire and exploded the flash.

Official Photograph, U. S. Army Air Corps

BARRO COLORADO IS ONE OF THE MANY ISLANDS STUDDING GATUN LAKE

Seen from the air, one can best appreciate the primitive state in which Barro Colorado has remained. This island, in the foreground, has an area of about six square miles, and rises to an extreme height of 452 feet above the lake. As shown by the unbroken sea of tree tops, it is densely forested and has been set aside by the Government as a sanctuary wherein the wild life of tropical America may be conserved and studied (see text, page 331, and map, page 332). The arrow points to the laboratory.



Official Photograph, U. S. Army Air Corps

THE LABORATORY OF THE INSTITUTE FOR RESEARCH IN TROPICAL AMERICA AND ITS SURROUNDINGS FROM THE AIR

The cleared ground leading to the water is planted with bananas, yuccas, yams, and plantains. The dark patches extending upward from the landing place mark the course of a brook. Three trails penetrate the forest from the laboratory, but so carefully have they been made that their location is not apparent (see text, page 331).

AN OBSERVATION PERCH IN THE HEART OF THE FOREST

From such points of vantage many of the secrets of jungle life are revealed to the naturalist. Eighteen collared peccaries were seen here, feeding on fallen figs, and in the branches overhead six howling monkeys, four toucans, and five guans were gathering the fruit.

THIS SPINY RAT IS GETTING THE SCARE OF HIS LIFE

It is difficult to conceive a more terrifying experience for the timid and sensitive creatures of the woods than a sudden encounter in the night with the blinding glare of light and cannon-like report of the flash powder at a distance of only 10 or 11 feet. However, their fright seems to do them no permanent harm (see text, page 344).

has made us familiar and which William Nesbit has also developed. It was two of the latter's outfits which, in the margin of time left by my bird studies, I used upon the island.

Exclusive of bats, E. A. Goldman, in his "Mammals of Panama," records fifty-odd species of mammals from the Canal Zone. They range in size from mouse to tapir and include two species of peccaries, two of deer, the ocelot, puma and jaguar, and giant anteater, besides more easily observable arboreal forms such as monkeys, squirrels and sloths.

We do not know how many of these animals are found on Barro Colorado, nor have we exact information as to how the flooding of the lowlands affected the fauna of the island. As the waters slowly rose, many lines of retreat were open to the inhabitants of the submerged districts. Doubtless, therefore, they were widely distributed. But beyond question the protection afforded by insulation, and by the subsequent prohibition of hunting, has done much to maintain primitive conditions on the island and to give exceptional opportunity for study.

VARIOUS CONDITIONS DETERMINE LOCATION OF CAMERA "STAND"

To encourage the close approach of animals to the laboratory, the ground immediately surrounding our quarters has been declared *sanctum sanctorum* and flash-light photography is there prohibited. Beyond a distance of 300 yards, however, this restriction is removed and one is free to employ any fair means to capture the image of one's prey.

Now begins a still hunt for evidence that an animal has visited and will return to a given locality. During the dry season (December to April), when the ground is hard and usually leaf-covered, tracks are difficult to find. My limited experience has not revealed productive water holes.

One is therefore influenced in the selection of a camera "stand" by a variety of circumstances—the presence of fallen fruit, the density and character of the undergrowth. But in the belief, doubtless erroneous, that our trails look as attractive to animals as theirs do to us, I generally stretched the trip-wire across them. Furthermore, pictures of animals following human footsteps possess greater interest than those which might be secured in parts of the forest which we rarely if ever visit (see page 333).

After the stand is selected, the trap is set. This is an interesting operation. One visualizes the possible subject, the direction from which it may come, and determines the distance and angle at which it should be photographed. A fine wire is then stretched from tree to tree across the assumed pathway of the prospective subject and, after being passed through a staple, is run parallel with the trail to the battery near the camera. Unless it be properly guarded, this side wire may be sprung by some animal crossing, instead of following, the trail.

Early in my experience with this kind of hunting, I had gone less than 200 feet from a camera after setting it when the charges exploded. The sound resembles the report of a small cannon. Smoke was still drifting through the trees when I reached the stand, but no sign of life was visible. The development of the plate, however, revealed the tip of the tail of a coati which had crossed the trail directly in front of the camera.

Two metal cups, each containing a box holding half an ounce of magnesium powder, are attached to trees slightly above and behind the camera. One of them is connected with the camera shutter so that the force of the recoil occasioned by the explosion exposes the plate at the moment of greatest illumination. A 6-inch lens is used wide open, and the shutter is set for an exposure of a two-hundredth part of a second.

BANANAS MAKE POPULAR BAIT

After the several wires are connected, the shutter arranged, and the slide drawn from the plate holder, it remains only to close the switch that sets the trap. Electrical devices in the hands of the uninitiated sometimes do inexplicable things. I never complete this connection without tense expectation of its attendant possibilities. Assuming that they do not materialize, one backs off carefully and, if one's way leads past the trip-wire, steps over it cautiously (see page 333).

The question of bait is important.

Food tied to the trip-wire may attract large game, but it is far more likely to bring the smaller rodents that throng the forest. With the hope, therefore, of securing animals too large to pass beneath the wire, no bait is employed during the first three or four nights at a new stand. Or the trail may be dragged with meat, fish or fruit. If these fail to yield results, a ripe banana tied to the trip-wire was found to make a more universal appeal than any other food.

After these details are attended to, you return to camp. Possibly during the night you hear the booming report of an explosion, and visualize the eye of the camera opening and closing to record on the "retina" of the sensitive plate a potential image of whatever "fired the flash." In North America, where the fauna is well known, one may usually surmise whether he has caught large game or small. But there is no census of the animals of Barro Colorado and the possibilities include most of the terrestrial Mammalia of the American Tropics.

The magnesium powder is packed in red boxes, the tops of which may be seen from some distance in the shallow metal cups from which they are exploded. Inserted with full faith in their potency, these neat little disks spell failure if you find them still on guard when you return. But if in their place there is a scorched box bottom and a burnt-out fuse, anticipations which were born when the stand was selected acquire new strength.

What manner of beast sprung the trap? The trip-wire and its surroundings are examined for clues. The extent to which it is stretched gives an indication of the strength of the animal that sprung it; the direction in which it is stretched tells from which side the creature came. If the wire is broken imagination, given the rein, runs wild among the larger possibilities.

THE NATURALIST JOYS IN HIS PHOTOGRAPHIC "BAG"

At times a footprint is visible, deepened perhaps by the spring of the startled animal which, in the stillness of the night and security of its haunts, suddenly comes into close quarters with thunder and lightning.

Between failure and success interpose also the countless mishaps of photography. These are increased in the Tropics where in a moment a perfect negative may become merely a piece of glass or an entire landscape be devoured by a cockroach.

To avoid unnecessary handling, plates are developed by time, a desirable method in any event where the intensity of the light and length of exposure are always the same. The climax of the whole procedure is not reached, therefore, until the plate comes from the hypo clearing solution and the alchemy of the dark room adds to the magic of the camera trap.

THE CAMERA RECORDS SHY ANIMALS

Besides agoutis, coatis and other small game, imagine the satisfaction with which I beheld the images of two white-lipped peccaries, the joy occasioned by the figure of a stalking puma, or the supreme exultation with which I discovered that I had actually photographed a tapir in the surprising act of eating a banana! (See illustration, page 339.)

It was soon after developing this plate that I wrote the opening paragraphs of this article. Not one of these animals had been seen on the island, and, other considerations aside, the pleasures of life on Barro Colorado were materially increased by the knowledge that I had such distinguished neighbors.

At the beginning of my venture in this, to me, new field, I found that the photographic bag of one visit to the dark room held two ocelots and a puma. At that rate I saw myself the early possessor of a unique gallery of portraits of tropical American mammals. But the succeeding three months failed to bring another ocelot and it was two weeks before the traps were sprung again.

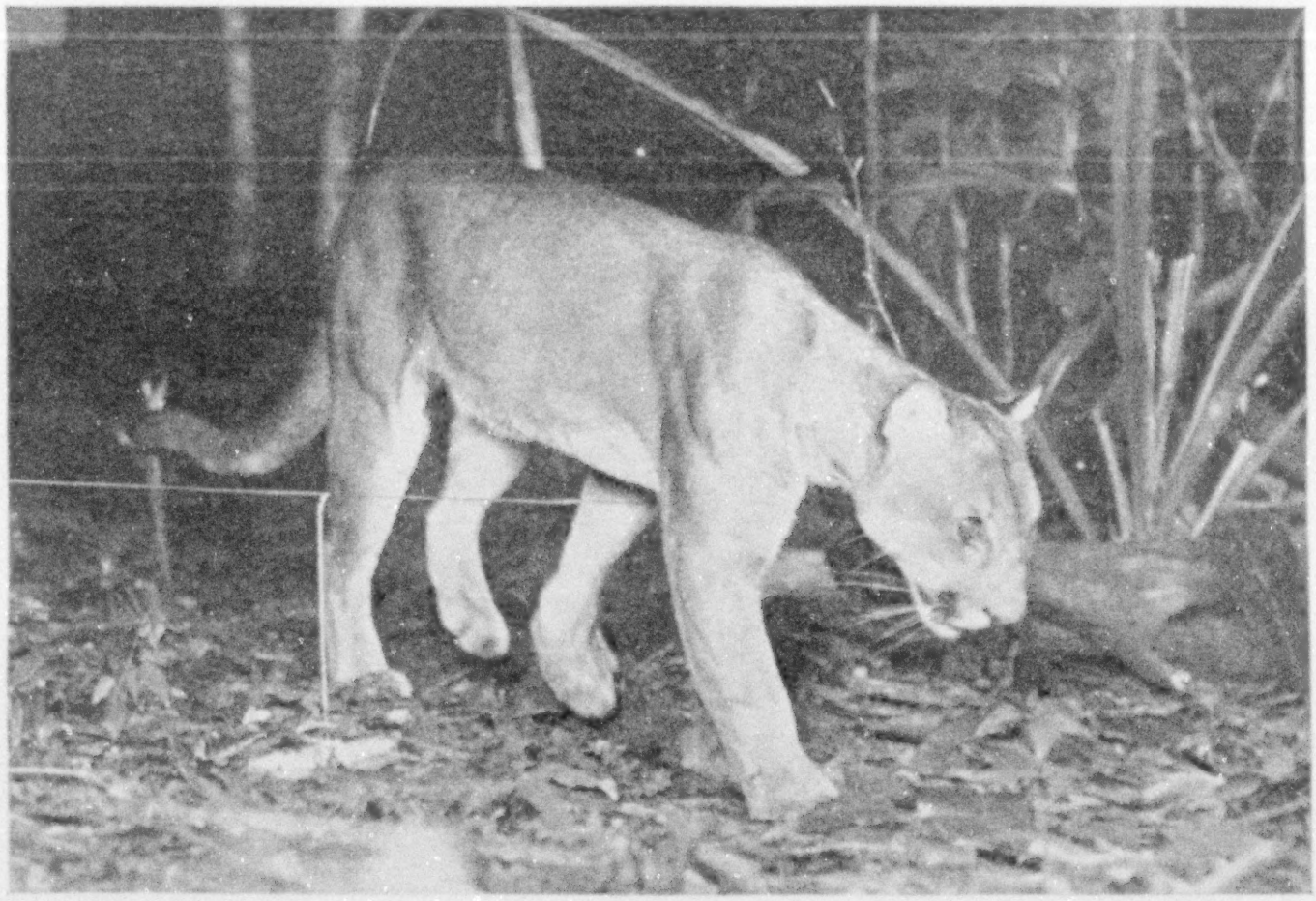
Then ensued a series of mishaps. The charges were fired as though by an unseen hand, for the developed plate revealed no sign of life. Once the trip-wire was actually untied from its fastening without the flash being fired. Later I learned that heavy leaves falling on the wire, or the swaying of trees to which it was attached, may cause premature discharge of the magnesium. Yet the method by which the wire was detached without the electrical connection being completed remained a mystery. It was through no fault of the camera which, after three

SAVAGE MEMBERS OF THE SWINE FAMILY

These white-lipped peccaries stand about 16 inches high. They are peculiar to the Western Hemisphere, and inhabit South and Central America from Paraguay to British Honduras. They travel in herds of large size, and when angered will attack anything, including human beings.

A BANANA TEMPTED THIS TAPIR

Inoffensive and shy at most times, but capable of fierce resistance on occasion, the tapir is one of the oldest and least changed of animals. Fossils of specimens that lived in a remote period are nearly identical with tapirs of to-day.



THE PUMA USUALLY TAKES WELL TO CAPTIVITY

A legend persists among the Indians and Gauchos of South America that the puma is the one wild member of the cat family that is naturally friendly to man.

THIS CAT SHARES WITH THE JAGUAR THE LORDSHIP OF THE AMERICAN JUNGLE

The puma is the only beast in the Central and South American jungles powerful enough to dispute the dread jaguar, which it excels in agility.

IN MANY RESPECTS THE PUMA IS AN OVERGROWN KITTEN

Pumas will frolic together or alone, fight sham battles, chase butterflies, or play hide and seek. This animal is not fully grown (see text, page 342).

A SLEEK AND CUNNING BEAST OF PREY

Ears back, head down, and nose to the ground, this lithe-limbed puma is the embodiment of stealth and strength. He is the largest of the pumas photographed.

months of exposure to humid, tropical weather, remained in excellent condition.

It will be a long time before the possibilities of Barro Colorado's fauna are exhausted, before a jaguar and giant anteater have automatically registered themselves as present there. It will be longer still before one ceases to be thrilled by the capture of the portraits of animals so shy and retiring or so exclusively nocturnal that we rarely if ever see them.

There is endless interest in recording new phases and expressions of even the commonest animals. Bananas rarely failed to attract the raccoonlike coatis, probably the most common of the larger animals on the island. They showed surprising skill in removing the bait without firing the flash, and, in spite of their numbers, it was difficult to secure satisfactory pictures of them (see pages 343 and 344).

The peccary, with its head pressed against the trip-wire, seems to have paused at the command of the photographer; only its upraised foot shows that it was in motion (see illustration, page 339).

THE FLASH LIGHT SURPRISES THE UNSEEN PUMA

The animal crowding in at the side illustrates the manner in which these creatures travel in close-massed groups. Doubtless there was a sudden breaking of ranks at the glare and report that followed the tautening of the wire. Nevertheless, within two days a band of peccaries, perhaps the same one, passed this way. The next night the charges were fired at 2 a. m. by an ocelot, indicating that these cats are not only crepuscular but truly nocturnal.

The camera's most surprising revelation was proof that pumas, as yet unseen by us, are common inhabitants of the island. All my pictures of this animal were secured within a radius of half a mile, and most of them represent not only different individuals but different moods of the species.

One puma (see illustration, lower, page 341) is the typical beast of prey, slinking along with head down and ears back; a vicious-looking, well-fed animal, evidently at the maximum of his powers.

He is, I think, the largest of the pumas photographed. Approaching night caused me to set hurriedly the trap he entered. The lateral wire leading to the battery was not well protected. The following day it was found widely sagging and the charges exploded—evidence that an animal had entered from the side.

Development of the plate apparently confirmed this diagnosis by recording what appeared to be a portion of an agouti much out of focus. At the same time, I developed a plate showing leaf-cutting ants (see, also, page 344). Having accounted for the flash light I held this second plate to the light, with the image of ants in my mind's eye, only to discover the figure of a superb puma. My diagnosis had been wholly wrong, and transposition of the two plates in the developing tray had led me still further astray.

The surprise occasioned by the transformation of a mental ant into an actual puma was exceeded in the winter's experience only by the discovery that a supposed coati was in truth a tapir, the largest and one of the most elusive animals of the region.

The pumas shown at the top of pages 340 and 341 were photographed at an interval of three months and at stations a mile apart; nevertheless, I believe them to be the same animal. The figures agree in size, proportions and markings. Since the camera in all these pictures was set at the same distance, 11½ feet, from the wire, objects there are always comparable as to size.

Observe, therefore, the agreement in dimensions of the foreleg in these figures. Incidentally, in one photograph (page 341) the trip-wire is broken; in the other it has been cleanly stepped over with the right forefoot and was evidently sprung at the succeeding step.

THE OCELOT INTENTIONALLY CLEARS THE TRIP-WIRE

With the ocelot (p. 330) essentially the same fact is shown, but here the left forefoot was the first one over. It is a question whether these animals stepped over the wire unconsciously or whether they sensed it, even in the dark, and intentionally cleared it with the first foot. Steps 9 or 10 inches high (the distance of the wire from the ground) would imply needless exertion where the trail was open.

THE AGOUTI IS AMONG THE SHIEST OF FOREST CREATURES

The agouti, a cousin of the guinea pig, is common in Central and South America. It is swift in its movements. Its fur is long and thick, and usually chestnut or olive in color.

RACCOONLIKE COATIS ARE NUMEROUS ON BARRO COLORADO ISLAND

Possessing habits of the raccoon and the squirrel, the coati is an arboreal little animal, living principally on birds, mice, worms and insects. Although playful, he is not a pleasant-looking creature because of his long, piglike snout (see, also, text, page 342).

ENJOYING A BANANA AS THE PRICE OF HIS PICTURE

The coati succumbed to the lure of a ripe banana, thereby bringing on himself the lightning and thunder of the flash powder. The large, round object is the nest of termites, or so-called "white ants," that was tied to the wire in the hope that it might attract an anteater.

Obviously the second step is not that high. It would appear, therefore, that these cats, even in the dead of night (the ocelot picture was made at 2 a. m.) are aware of the presence of the wire and make a partial attempt to step over it.

The flash of the peccary, on the contrary, shows that the animal made no attempt whatever to avoid the wire into which its muzzle is pressed (see, also, text, page 342).

Returning to the comparison of the pumas shown on pages 340 and 341, it will be seen that not only are they marked alike—observe especially the light specks above the shoulders—but that they wear much the same expression. Assuming, therefore, that this is but one individual, the two pictures admirably illustrate one of the most distinctive features of camera-hunting, namely, that we may capture the same animal an indefinite number of times and still leave him as free as he was in the beginning.

In this particular instance, it is not only especially reassuring to believe that the two pictures are of the same individual, but also that the earlier experience has left no visible result on his expression. It is true that in one picture he apparently stepped on the wire, while in the other he stepped over it; but aside from this difference he seems to tread the trail with confidence.

PHOTOGRAPHING AN ANIMAL'S FEAR REACTION IS UNSPORTSMANLIKE

I do not believe that we can realize what a shock it must be to these timid, exceedingly sensitive creatures to be flash-lighted. It is difficult to conceive of a more terrifying experience than this sudden encounter with a blinding glare of light and cannonlike report at a distance of 10 or 11 feet. This is the one objectionable feature of camera-hunting at night.

I am often asked whether it would not be possible with a second camera to photograph the animal's reaction to the flash. It can be done, it has been done, but I do not want to do it.

The charm, as well as the value of these pictures, is in their capture of the un-

EVEN BIRDS MAY BE BAGGED BY THE FLASH-LIGHT PHOTOGRAPHER

Although this picture was made during the day, the forest was so dark and the exposure so rapid that it resembles a night flash light. The beautiful white snake hawk was attracted to the trip-wire by a fish head.

suspecting animal as it prowls the forest on its nightly beat. To yield to our curiosity to see "what happens" is to destroy this feeling of seeing while unseen and, at the same time, to take unfair advantage of the animal. It is bad enough to frighten a creature; to photograph it in the act of responding to the uncontrollable impulse of fear is adding insult to injury.

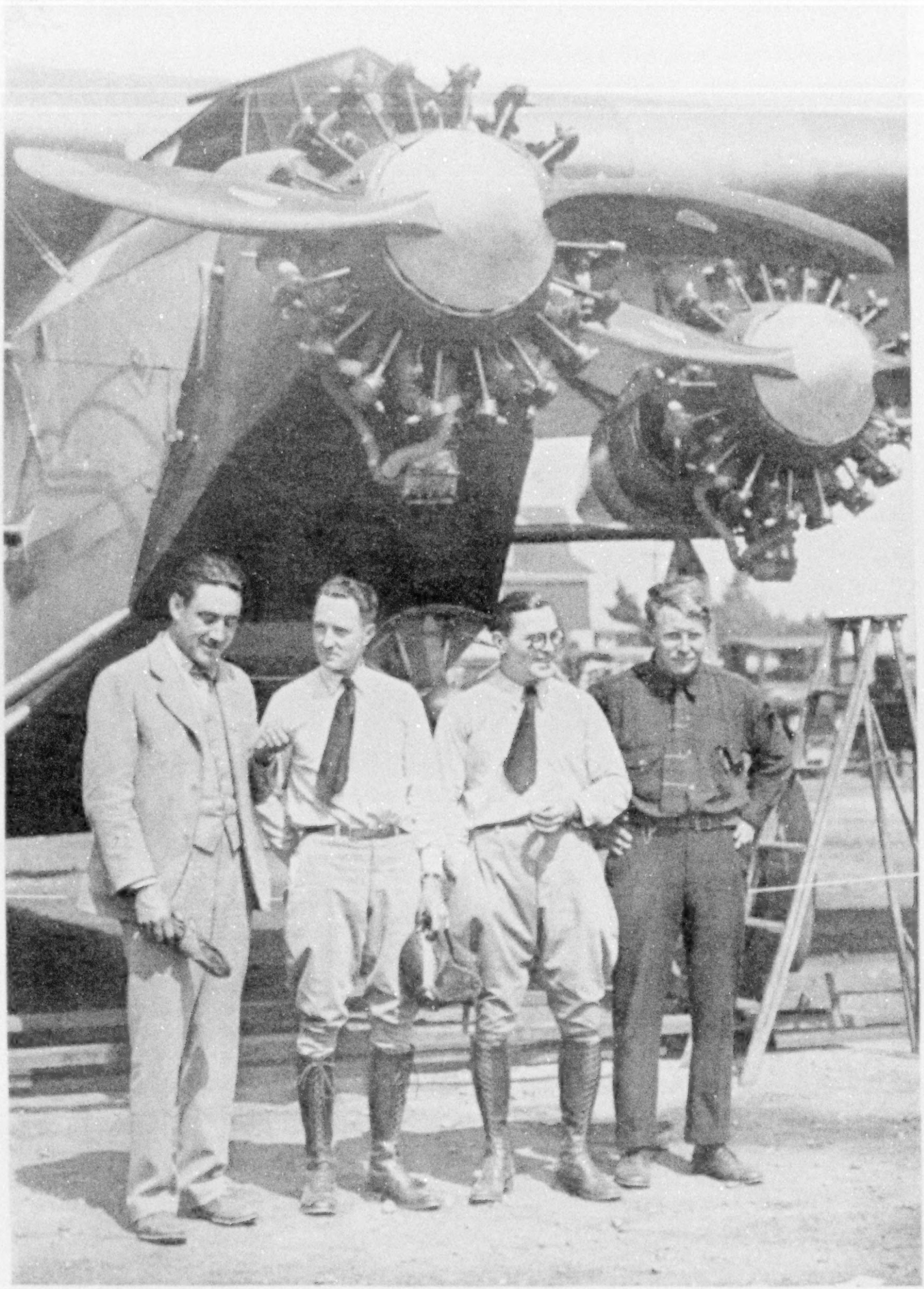
Another puma (see page 340, lower) is distinguished by the large amount of black on its muzzle. It is apparently a full-grown female, perhaps the mate of the one above, though this is pure surmise.

HOW A UNIQUE PICTURE WAS OBTAINED

The left forefoot has crossed the wire, which was evidently sprung at the next step. No attention whatever was paid to the banana tied to the wire with white cord, and it remained for a Baird's tapir to take firm hold of this fruit and give the wire a tug which resulted in the unique picture shown on page 339.

Mice, rats, agouti, birds, even bats have automatically recorded themselves on this camera register. But there are other inhabitants of Barro Colorado who have evaded it. There is the collared peccary, so common that we see it almost daily, but so wise that thus far it has dodged the camera wire. There are the exquisitely shy forest deer, the paca and the great bushy-tailed anteater. Above all there is the jaguar, king of American cats (see, also, illustrations, page 336 and above).

Aside from their importance as pictorial records, the chief value of these pictures is the graphic evidence they afford of the primitive character of Barro Colorado's fauna. A satisfactory study of the relation of an animal to its surroundings, physical and organic, can be made only when these surroundings are essentially natural. The removal of but a single species may affect the entire fauna. The introduction of a species may be followed by equally far-reaching results. In other words, the origin of structure and habit, the function of form and color, should be studied where the conditions of life have been undisturbed.



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ARGONAUTS OF THE FOG

The gallant crew of the *America*, heroic in the face of numerous adversities, not only added a notable chapter to flying annals, but also recorded valuable scientific data for transocean flying of the future. From left to right: Bertram B. Acosta, pilot; Commander Richard E. Byrd, leader and navigator; Lieut. George O. Noville, engineer and radio operator, and Bernt Balchen, relief pilot and mechanical assistant.

OUR TRANSATLANTIC FLIGHT

By Commander Richard Evelyn Byrd, U. S. Navy (Ret.)

Author of "Flying Over the Arctic" and "The First Flight to the North Pole," in the National Geographic Magazine

The National Geographic Society is privileged to present to its membership the first magazine story from the pen of Commander Richard E. Byrd, leader of the "America's" historic and dauntless flight from New York to France. Members also will recall that The Geographic *presented the first accounts of his Arctic flights under their Society's auspices and of his aërial conquest of the Pole. Commander Byrd and his gallant companions have performed a signal service to aviation science and are receiving the well-merited acclaim of the Nation. To give his thrilling message to The Society's membership without delay necessitated its appearance in the last pages of this issue.*—The Editor.

IT LONG has been my ambition to attempt a transatlantic flight for two reasons: to help the progress of aviation and, in a small way, to further international amity.

When the *America* was christened the French and American flags were flown together. Before the christening, 2,000 people gathered about the plane. As we mounted the speakers' platform I was told that Col. Charles A. Lindbergh had reached Paris. So we turned our christening into a celebration of Lindbergh's triumph. Thus I was the first man to make a speech about his remarkable achievement (page 349).

Lindbergh did more for international relations than we thought possible and so we were glad that he got there first.

FLIGHT NOT PLANNED AS A RACE

A good-will flight had been for years the dream of our backer, Mr. Rodman Wanamaker. We bore friendly messages to foreign officials and, as a gift to the French Republic from Mr. Wanamaker, we carried one of our most precious relics, a piece of the bunting from which was made the original American flag.

As we had repeatedly announced, we were in no race. Even had we been, we were completely out of the running when our plane crashed on the factory test. Floyd Bennett, who worked with me in planning the flight, was desperately injured, through no fault of his own, and now, months later, is still in the hospital. His great ambition to cross the Atlantic was shattered as was his body, but not his indomitable courage (see illustration, page 353).

Bennett and I worked as a team. It was broken, but Floyd said, "It is our duty to see this flight through." He was right, so we repaired my broken arm and the *America* and it rose again to show itself the great plane we thought it was, typical of the transatlantic craft of the future.

We were anxious to establish certain scientific facts. We thought that the transatlantic plane of the future must be a multi-engine one that would fly with one of the engines out of commission. That would give the degree of safety necessary for taking passengers across the Atlantic.

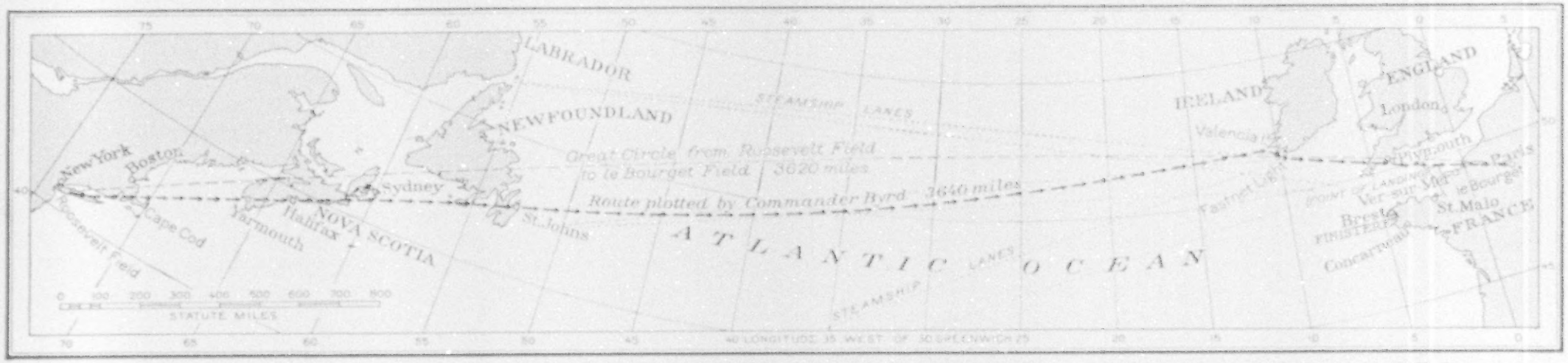
We also wanted to demonstrate that it is possible to carry a useful load of 500 or 600 pounds, three or four people, and an efficient radio. As a matter of fact, the *America* could transport eight or nine people to France in addition to the useful load.

Other pioneers, however, must follow these three successful flights. I believe that in ten years regular transatlantic flights will be made.

It is possible now to build a large plane, with twice the wing spread of the *America*, that will transport 15 passengers and three or four times the useful load we carried.

Many problems confronted us when we started our preparations. No one knew what the cruising radius of a huge, three-engine plane such as ours would be.

But should one of the engines stop on the *America*, when lifting a very heavy load, we could with our dump valve let gasoline go overboard until the total weight of the plane would be 10,000 pounds. Then it would have a cruising radius of about 1,200 miles with the two engines. The advantage of this type of plane for flying over the ocean is apparent.



Drawn by A. H. Bumstead

COMMANDER BYRD PLOTS A NEW TRANSATLANTIC ROUTE ALONG WHICH FUTURE FLYERS MAY CROSS ON SCHEDULE

Commander Byrd worked out this course for his transatlantic flight, because it requires the simplest navigation. It can be flown by dead reckoning from St. Johns, Newfoundland, to Valencia Island, Ireland. In this work Commander Byrd had the coöperation of the National Geographic Society and its chief cartographer, Albert H. Bumstead. Commander Byrd forsook this course to take advantage of winds at various altitudes.

Photograph from Wide World

WAITING FOR THE WEATHER MAN

During the days of weary delay the *America* was always ready to take off, but Commander Byrd insisted the flight was not a race, but a voyage for scientific observation. The flyers were not awaiting ideal weather, but took off the moment the meteorologists indicated conditions which offered a reasonable margin of safety (see text, page 347).

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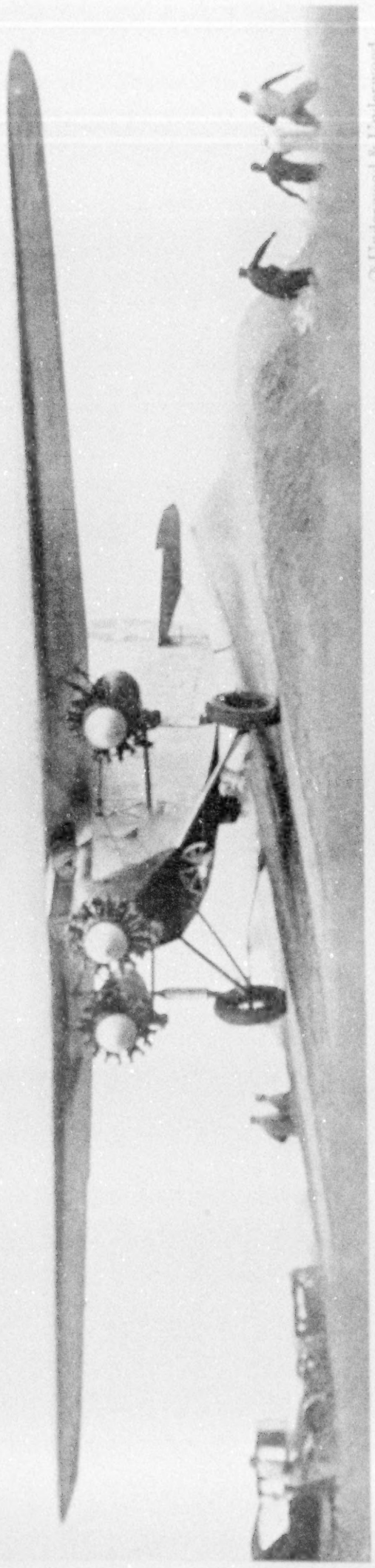
THE "AMERICA" IS CHRISTENED ON ROOSEVELT FIELD, LONG ISLAND

In this ceremony waters taken from the Delaware River at the site of Washington's crossing were used. The christening became also a Lindbergh celebration, because, at the moment of stepping on the platform, Commander Byrd received the news of his fellow flyer's arrival in Paris, and thereupon made the first address in tribute to Lindbergh's feat (see text, page 347).



READY TO TAKE OFF

This runway was specially designed and made to meet the important problem of getting the *America* into the air with the heaviest possible load. Another factor in the successful start was the daily rolling and leveling of Roosevelt Field.

© Underwood & Underwood

We had a catwalk arranged so that we could climb out to the engines and make minor repairs on them while flying.

With the *America* we felt that we had reached that point where a motor stoppage need not mean disaster from a forced landing and, for ordinary flights, need cause no real apprehension.

Because it was impossible to tell just how much they would lift, little was known about the cruising radii of such planes. Of course, the more the plane can lift the more gasoline it can carry, and the greater is its cruising radius. It is no child's play to swing heavy loads into the air. I felt the responsibility for the safety of my crew and realized that one of our greatest dangers was in taking the heavy load off the ground.

NARROWLY ESCAPED TRAGIC FATE OF OTHER PIONEERS

The only three-engine planes that were built to cross the Atlantic crashed. Davis and Wooster with the *Pathfinder* (*American Legion*), and Fonck with the Sikorsky plane, met tragedy; and our crew, with the *America*, almost met a similar fate.

When the *America* rose again, after repairs to the forward part, I made up my mind that, regardless of the pressure being brought to bear upon me, I would take my time and do everything humanly possible to get that plane safely off the ground with the load necessary to fly 4,000 miles.

Grover Whalen, Mr. Wanamaker's representative, rented for us Roosevelt Field, on Long Island. Then, with the care that he exercised in all matters where he could back us up, he had the field rolled and leveled day after day, as we suggested.

A long run on the ground before a plane will take the air is necessary when flying with heavy loads. That is why we took

such care with Roosevelt Field and it is gratifying to us that Lindbergh, Clarence D. Chamberlin, and the *America* took off from this field.

At the suggestion of Mr. Anthony Fokker, the designer of our monoplane, we built a hill at the end of the runway which gave us a good start and had the effect of adding probably 700 or 800 feet to the end of the runway.

MUST ADJUST ENGINE SPEED TO WEIGHT CARRIED

Few people realize how difficult it is, with a plane like the *America*, to obtain revolutions of the engines for the various loads carried that will give maximum mileage per gallon of gasoline used, because these revolutions vary for every different weight carried. Of course, as the plane consumes gasoline, there will be an infinite number of ever-lightening loads. To calculate this we had to run over a course of known length, noting the speed over the ground and the fuel consumption for each number of revolutions. This had to be done for all the different loadings of the plane.

The calculations proved fairly accurate, but they were difficult to make because of rough air and winds blowing across the course, which affected our speed over the ground. We decided, after many tests, that we probably could fly to Rome.

Our radio set was devised especially for our flight by Malcolm P. Hanson and L. A. Hyland, in the Naval Research Laboratory at Washington, with a view to the greatest possible sending range for its weight. The set itself weighed only 25 pounds, and the entire mechanism, including the mountings, both the main and emergency set, and switch box, added only 120 pounds to our load.

One of the most interesting features of our radio was the automatic sending device, by which call letters were repeated constantly, at the rate of about ten complete calls a minute on a prearranged wave length.

The next important matter was the meteorology. There was no suitable transatlantic meteorological service and this had to be devised. Commander Noel Davis and I requested the Secretary of Agriculture to give us the coöperation of the United States Weather Bureau. This was granted. The bureau needed reports of conditions over the Atlantic, so we requested the Radio Corporation of America to procure radio reports from seagoing ships, which was done.

The Weather Bureau assigned Dr. James H. Kimball, of its New York office, to make weather predictions for the transatlantic flights and, for the first time in history, regular weather maps for aviation uses were made of the North Atlantic. This work, I think, undoubtedly is the beginning of a valuable meteorological service. I was further assisted by Mr. Roswell Barratt, of New York, who received reports from Dr. Kimball and spent many nights with me studying weather conditions.

Many times we sat up nearly all night hoping that the weather would be suitable for taking off next morning at daybreak. I began to receive numerous letters of criticism for not starting. As a matter of fact, after Lindbergh's reception in New York, we left when we got the first partial O. K. from Dr. Kimball.

At 1 a. m., June 29, 1927, Dr. Kimball phoned that, though conditions were not ideal, it might be possible to leave soon. I had determined not to wait for such conditions, because I felt that the transatlantic plane of the future could not wait for *ideal* conditions. Moreover, we probably could gain more scientific and practical knowledge if we met some adverse weather.

CREW MAKES READY FOR START

I now think that the *America* could conquer almost any storms that might be met in crossing the Atlantic. The only weather condition that need be serious for the planes of the future is a hurricane, which might exhaust the fuel supply.

Having decided to start, I telephoned my loyal crew to prepare the plane for the flight. When I reached the field at 3 a. m. (standard time), June 29, the plane was at the top of the little hill and, by the aid of powerful lights, the crew was applying the finishing touches. It was dark, dismal, and raining slightly, but even then a large crowd had gathered.

We felt that probably the most critical period of the whole flight was at hand,

that of getting into the air with our load of about 15,000 pounds.

We warmed up the engines gradually and took our places in the plane, with Bertram B. (Bert) Acosta, one of our most experienced pilots, at the wheel. Lieut. George O. Noville sat with his hand on the dump valve to release the gasoline in case we could not get off the ground or should a crash threaten at the end of the runway.

We put the engines on full; the plane strained at its leash like a live thing. Tom Mulroy, knife in hand, stood ready to cut the rope that held the plane, but the tug of the great engines broke the line, as I learned later, and we started down the runway a little sooner than we had expected. The engines were not warmed up as much as we had intended and it looked for the moment as if we might not get into the air before reaching the end of the runway. Once Acosta raised his hand to Noville to dump. It was a tense moment and much hung in the balance, but just then the wheels left the ground and we started on the toughest air battle, I believe, that has ever taken place.

Slowly the great ship gained altitude with its tremendous load. That was a critical time because, should any one of the three engines stop until we could get an altitude of 400 or 500 feet, the dump valve would be of no value, and the plane would crash.

A DRAMATIC START ON "TOUGHEST AIR BATTLE"

I made notes in my log and remarks in my diary, the same diary carried over the North Pole with me, and I find this entry made a few minutes after leaving Roosevelt Field: "Altitude 300 feet, turning, after turn completed, altitude 400 feet." The *America* had climbed on a turn and was proving herself a very great plane.

With the engines roaring at maximum revolutions we went through the air at 100 miles an hour. It is necessary to fly faster with a heavy load than it is with a lighter one in order to keep in the air.

Slowly we climbed and shortly afterward I find the following notes in my log:

"Raining, fog, clouds low, standard compcompass 83½°, wind southwest nonsurface, drift 5° right, air speed 100 miles an hour, altitude 3,000 feet."

We had to change the course of the plane five degrees to the left to allow for this drift. I had been taking our speed from the ground and found that at our altitude of 3,000 feet we were getting probably the maximum assistance from the winds (see, also, page 361).

The air navigator of the future, I believe, will select the shortest route through the air by flying at that altitude which yields the maximum assistance from the wind. The wind changes, both in speed and direction, at an increased altitude. Greater speed and quicker time can be obtained by taking advantage of this fact, as we proved on our way to Newfoundland.

The rain continued for several hours and the weather was slightly foggy, but these factors did not bother us to any extent.

KEEPS A SHARP LOOKOUT FOR TRACES OF NUNGESSER AND COLI

When we reached Nova Scotia the weather became clear. The air was bumpy and rough as it so frequently is in this region. We kept a sharp lookout for the plane of Nungesser and Coli, thinking it might have crashed on the rough land below. There were practically no landing places there that I could see. At one time I thought I saw their big white plane beneath, but it was a curiously shaped, whitish rock.

The ground was covered with trees and rocks and we passed over many small lakes. The rough air brought vividly to my mind the first successful transatlantic flight expedition, by way of the Azores, of our Navy's *NC* flying boats, in May, 1919.

When we passed near Halifax, we were flying over beautiful white clouds, but the sun was bright above us. The shadow of the plane was etched on the clouds, and around it was a rainbow. Here was an omen of good luck, following us on the white clouds beneath, at the rate of 100 miles an hour.

The plane was still cluttered with five-gallon cans of gasoline. Every now and then as I sighted the ground with our wind-drift indicator, through the trapdoor in the bottom of the plane, I could see a white object shoot down, glistening in the sun. These objects were gasoline cans that Noville was throwing overboard after he emptied them into our huge tank.

Photograph from Wide World

"IT IS OUR DUTY TO SEE THIS FLIGHT THROUGH"

Gallant Floyd Bennett, gold medalist of the National Geographic Society, who flew with Commander Byrd on the MacMillan Arctic Expedition of 1925, and on his flight to the North Pole, was so seriously injured when the *America* crashed during the factory test that he had to forego the transatlantic air voyage, although his interest in the preparations remained keen. Visiting Roosevelt Field in an ambulance, he hobbled out to get a last look at the monoplane and to wish the commander and crew Godspeed (see, also, text, page 347).

I had put up an air station at Halifax for the Canadian Government and there I was, flying over territory that I had flown many times before, and I knew we would strike rough air. When we reached the beautiful Bras d'Or Lake, I looked down on the rough shore where Walter Hinton and I had been washed ashore after a forced landing.

We had not gone far from Newfoundland before we encountered the dread fog, aviation's greatest enemy. There would be no chance to take a departure from St. Johns and thus be entirely certain of our position before striking out over the ocean. We had to fly "blind" for many miles over the land before hitting the water.

At 2 p. m. all the gasoline cans had been emptied and I asked Noville for a check on the gasoline consumption. This check showed that it had been greater than we had anticipated and I gave instructions to "lean" the mixture and to cut down the revolutions as much as possible. We had

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ST. MALO REARS ITS RAMPARTS FROM THE SEA

The beaches of this famous seaport are more preferred for bathing than are those of Ver-sur-Mer, the more modest resort on the Norman coast, where the *America* landed. They consist of fine sand and slope gradually, whereas the latter's are mixed with rough pebbles. Most of the ramparts date from the sixteenth century, and from their top one looks out over the islet-dotted bay and over the curious old town itself, with its Old-World streets.

© Pacific and Atlantic

EXAMINING THE "AMERICA'S" ENGINES AT LOW TIDE

Commander Byrd and his flight companions came down at high tide and made their way to shore in their collapsible rubber raft. This type of aviation "lifeboat" was devised by Commander Byrd when he gained his first far-northern flying experience with the MacMillan Arctic Expedition, under the auspices of the National Geographic Society and the U. S. Navy, in 1925.

THE "AMERICA" IN THE WATER OFF VER-SUR-MER

After cruising for hours over land in thick fog and darkness without finding Le Bourget's landing field, near Paris, the *America* turned back to the coast and made a deliberate "crash," not a fall, into the water near this small bathing resort on the Norman coast. The plane at once filled with water, but the airmen escaped.

Unpublished photographs from Commander Richard E. Byrd

LATER THE PLANE WAS ALMOST SUBMERGED

Bringing down the *America* upon the water, with her personnel safe, was a brilliant feat in the adventures of aviation (see text, page 364). The little coastal village back of the alighting place proper is the "Plage de Ver-sur-Mer," meaning "the Beach of Ver by the Sea." The village is a mile inland (see text, page 365).

been going with almost a full throttle on account of the heavy load.

PLANE DRENCHED BY HEAVY FOG

When we met fog, it was, we thought, advisable to fight our way above it, and so, in climbing with our heavy load, we again had to run the engines at full speed. Slowly we got altitude and at 5:30 p. m. we found ourselves about a mile high, but in fog most of the time, and the plane was drenched. It would grow colder as night drew on and we would have to watch the temperature carefully, because, within 15 minutes, a plane so drenched could be precipitated into the ocean should the water freeze on the propeller and wings.

Finally we came to a point where we calculated that St. Johns was beneath us, but we could barely see the tips of the wings, so dense was the fog.

I recalled the non-stop flight of Alcock and Brown from St. Johns to Ireland. They accomplished that in 1919, when engines were not so safe as they are to-day. We must give England the palm for this great accomplishment, the first non-stop flight across the Atlantic.

Little did we think, as we went into the fog, that many hours would pass before we could see the land or the sea. After we had left the land some hours behind, I again asked Noville for his gasoline consumption. I told him to be conservative. His figures indicated that it was much greater than we had expected. One reason for this, I thought, was due to our struggle in attempting to get above the clouds and fog. This had caused us to run the motors much faster than we had intended.

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THE CHILDREN OF FRANCE WELCOMED THE HEROES OF AMERICA

First taken for tramps, in the dim light of dawn, the flyers hurried from door to door in a vain effort to awaken the villagers of Ver-sur-Mer, but when they told their plight to the lighthouse keeper and news spread of their identity, the entire population became their hosts and aides in salvaging their records and instruments (see text, page 365).

CREW VOTES TO PRESS ON DESPITE LOW GASOLINE SUPPLY

I made some careful calculations and showed Noville (in writing, of course, because the roar of the three engines prevented conversation) that, at that rate, with the slightest winds against us, we

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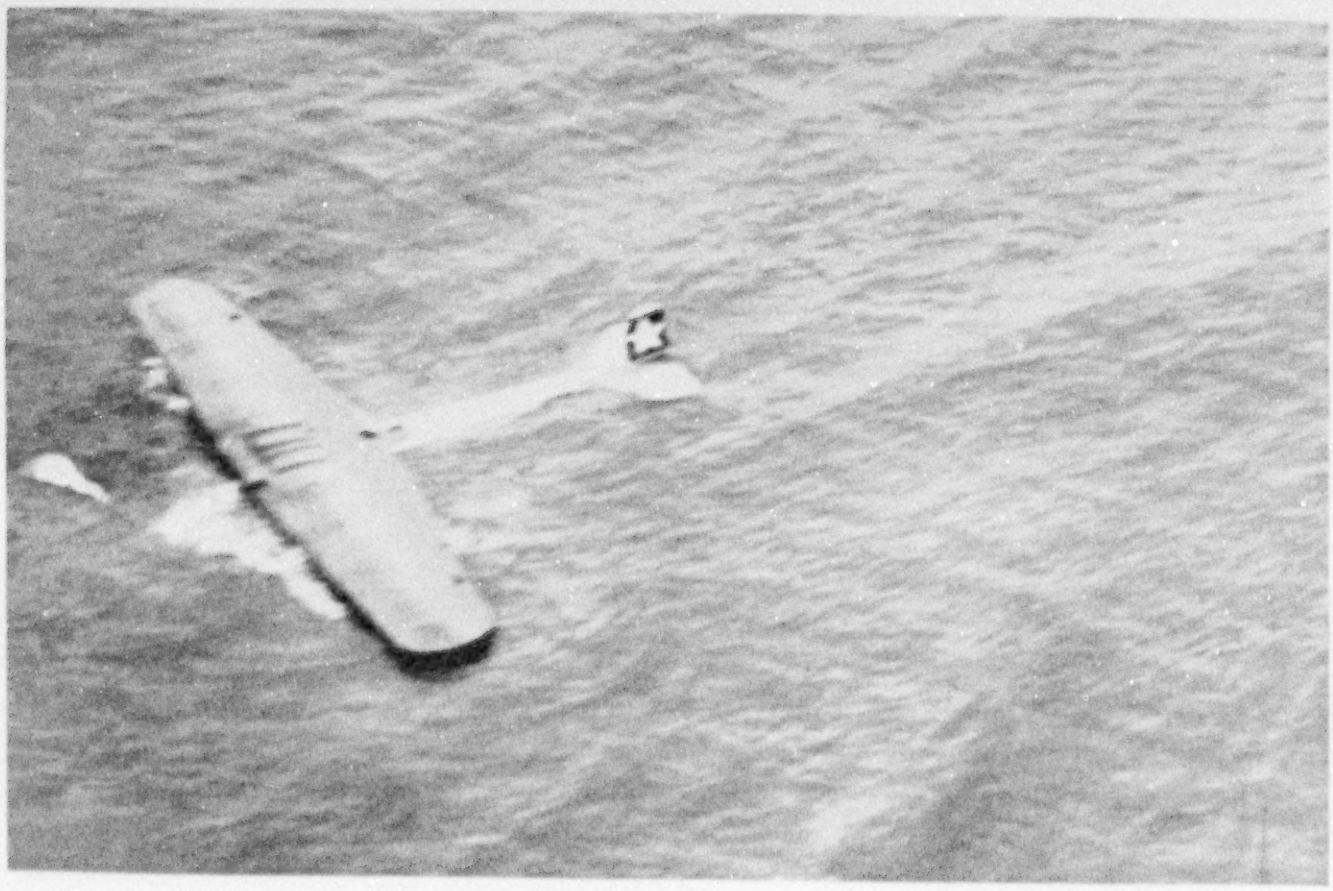
VILLAGERS OF VER-SUR-MER INSPECT THE WRECKED "AMERICA"

Fame literally descended during the night upon this obscure village on the Norman coast. Its beach would not be chosen for a landing place except in an emergency, because of hidden rocks and reefs offshore.



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THE "AMERICA," PARTIALLY SUBMERGED, PHOTOGRAPHED FROM THE AIR

Later the plane was towed ashore. Before that, however, the crew and the villagers had rescued valuable scientific records and instruments. The most precious relic that the *America* carried, a piece of the bunting from which the original American flag was made, was saved from the sinking plane by Commander Byrd.

would drop into the sea from lack of fuel before reaching Europe.

I told him that I was responsible for the lives of all on board and that, regardless of my feelings, I wanted them to decide whether they wished to turn back. He promptly answered that he knew of no landing place between Newfoundland and the States, except St. Johns, that was not covered with fog, so that it was just as safe to go ahead as to go back. I was glad he felt that way, because I did not wish to retreat.

I had studied thoroughly the velocity and directions of winds over the Atlantic. So far as I could learn, no reliable data had been procured upon the wind strength at high altitudes, but several meteorologists of the Weather Bureau had a theory that a plane could fly high enough to get strong winds from the west, even though there might at the same time be easterly winds on the surface.

This had long been my theory also, so I determined to stake everything on it and gave instructions to fly high and keep above the fog and clouds wherever possible. If we could have the winds with us, we would easily make Europe; if not, we would fall far short of it, if Noville's estimate of the gasoline on hand was correct. I also knew, from Dr. Kimball's weather map, which I had spread before me on the chart board, that I now was flying at first on the southern side of the storm area and later would be flying on the northern side of a high-pressure area.

INTRUSTS HIS SAFETY TO THE WINDS

I find notations made hour after hour in my log, as follows: "It is impossible to navigate."

Our safety depended upon winds behind us. I did not convey my apprehension to my shipmates. They had enough upon them already. It was a terrific strain. Only an aviator knows what it means to be 18 hours without seeing the ground or water beneath. I doubt whether any other plane has ever flown blindly for half that time.

One notation in the log stated: "Ice is forming on the plane." We were at a dangerous temperature. That was to be expected, flying two miles high in fog, because the temperature decreases considerably with altitude. I passed a note to Acosta warning him to make every effort to get out of the clouds, which he very soon did.

Acosta deserves great credit for his wonderful steering during this critical period. He showed himself to be a great pilot.

During the night, between turns at the wheel, Bernt Balchen had some sleep. As he moved restlessly in the restricted space from time to time, his foot nearly touched the handle of the gasoline dump valve. I watched him closely without awakening him, because if his foot should kick that, we would lose all our precious fuel.

FIGHT WAY THROUGH PITCH-BLACK CLOUD

Several times I took my turn at the wheel and realized what a strain Acosta and Balchen must have been under, steering for hours entirely by instrument.

Our night lights worked well and we also had powerful flash lights. We did not use the latter very much, because every time we flashed them we were blinded. The dials and figures on our instruments were luminous and I had a special portable light for my chart board.

I had left behind my rather heavy thermos bottle of tea, but during the night Noville gave me some of his coffee. It was only lukewarm, but it tasted good. We had plenty of drinking water. I ate a little roast chicken, but did not want to eat too much, because I knew it would be necessary to keep awake.

From time to time during the night we fought our way above the clouds. It was a weird sight to look down from the pinnacle of black masses we were skimming. Around us were ominous, towering peaks, some of which reached far above us. As we could not afford to go around those that lay in our path, we would dash through them in a darkness so intense that we could not see the wing tips. The fire from the exhaust pipes of our faithful engines, invisible in the daytime, shone vividly in the dark night. The 40,000 flashes of fire per minute through the exhaust pipes made a cheering sight in the darkness.

On one occasion in a thick cloud the plane got temporarily out of control. We must have been going downward at a terrific rate, judging from the roaring of the en-

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"FRANCE GAVE US HER VERY BEST"

In Paris, at the Gare St. Lazare, such a dense throng met Commander Byrd and his crew on their arrival from Ver-sur-Mer that they had difficulty in getting away from the railroad station. Here, as elsewhere in France, the aviators found "the friendly, generous heart of the French people," in a joyous, enthusiastic welcome (see, also, text, page 367).

gines, but Acosta, with great skill, finally steadied the ship again on its course. Throughout the long night each man went about his duty efficiently and calmly, taking it as if it were all in a day's work.

I note in our record that I sent the following radio at 6:50 a. m. on June 30: "We have seen neither land nor sea since 3 o'clock yesterday. Everything completely covered with fog. Whatever happens I take my hat off to these great fellows."

In those minutes between twilight and dusk we reached sufficient altitude to skim the tops of the clouds, and the spectacle was extraordinary. On the side of the sun, which, of course, was far below the cloud horizon, the clouds took on weird shapes and colors, but on the other side they were ominous and gloomy. During the day we had some terrifying views; there were fog valleys, dark and sinister, hundreds of feet beneath us. At times distant cloud peaks took on shapes and colors of rugged Arctic land and mountains.

We discovered a leak in the gasoline tank, but we had provided against that by bringing along a putty substance. Although we stopped the main leak, a little gas continued to seep out. After awhile it ceased, and, believing the gasoline had fallen below the leaky place, which was near the bottom of the tank, I concluded there was little gasoline left in it. I knew there would not be enough in the wing tanks to get us to land without great help from the wind.

I find this note in my diary: "Went forward at 3:15 a. m. to pilot and got stuck in the passageway." I had to tear off a sweater to get forward.

For many hours we had seen no land or water. "I sit here wondering if the winds have been with us. If they have not been, we do not reach land. I take my hat off to the boys with me. Their courage is marvelous."

From a study of the weather maps I concluded we were being drifted to the south.

From time to time we sent and received radio messages and it seemed miraculous that, flying two miles above the ocean, hidden in dense clouds, we could get messages from safe, comfortable places.

At one time Noville reported he had a message from a steamer somewhere beneath us and our signals were so clear that we must have been very near it. We were in dense fog at the time. He asked for condition of weather at the surface and the ship reported fog. We got its position and a radio bearing. This showed we were on a certain line and indicated we had been right in judging that the wind had drifted us to the south.

ABANDON IRISH LANDMARK TO GAIN AID FROM WINDS

A little later we had the position of another ship, the S. S. *Paris*, and this information put us somewhere on another line. Where the two lines intersected was our position. We were certain then that we had been drifted to the south and, instead of bucking winds to go to Ireland, we set our course directly for Finistère, France. Indeed, by allowing ourselves to go with the wind we had made better speed toward our objective. I could now, however, allow for the wind to a nicety and knew exactly where we would hit land, although we were still several hundred miles away.

We must give Noville credit for this accomplishment. It was a remarkable feat and was another triumph of science at which to marvel. Surely our whole flight was worth while, to demonstrate this one thing alone.

Our position indicated that we had been assisted by the wind about 30 miles an hour all the way from Newfoundland. We had made splendid speed.

I wanted to find out the worst about the gasoline, so asked Noville for an exact estimate. When he gave it to me I was astonished. It showed that he had been wrong in the last estimate he had made, which error was probably caused by the fact that the tail of the plane was somewhat down on account of the weight and the gasoline gauge did not register accurately.

Not long after that we came out of the thick, solid cloud layers into broken cloud fields and we could see the water beneath us. Though it was fairly rough it was a most welcome sight. We could see it every now and then, but that was enough to allow me to get my drift and to verify the fact that the wind was blowing from the northwest.

What a great contrast was our situation

now compared to what it appeared to be a few hours earlier! We could get glimpses of the sun and water; we knew exactly where we were; there was enough gasoline to get to Rome, and all engines were hitting perfectly. When I squeezed up into the pilot's compartment to take a turn at the wheel, I could tell from the faces of my shipmates that they were much relieved.

Soon we were getting many radio signals. They began to increase rapidly in number and Noville reported to me that he thought the whole of Europe was calling us.

PASS BREST ON COURSE TO PARIS

We hit land about the time we calculated and I am sure France never looked so beautiful to any of us before. We passed over Brest and set our course for Paris.

We had flown nearly a whole day without seeing land, and since one's processes seem to quicken when flying, the period seemed more like two days.

We had fairly good weather then, but it looked thick ahead. I asked Noville to radio to Paris to find out the condition of the weather there. It was reported thick and squally. Another battle was ahead of us.

In a way we welcomed the fight ahead. Here would be another test of aviation, and I felt we could conquer the elements with the gasoline we had left.

We probably could have flown on to Rome on the edge of the storm area and set the world on fire with the record, but that would not have been "carrying the message to Garcia."

We were able to locate accurately our position by the cities beneath us and the coast line to the left. But before long darkness began to descend, and with it came thick, rainy and ominous weather. Soon we got only occasional glimpses of the lights of the towns, and the thick, low-lying fogs or clouds drenched the plane. It was so inky dark that every time we put on the flash light to give an order it blinded us temporarily, so that we could only dimly see the luminous instrument board. However, the personnel and the many mechanisms of the plane continued to function efficiently, and I had every confidence of hitting Paris.

Should the thick weather be so low that we could not land at Le Bourget, I knew we would have to fly back to water and find some place for our landing that would not be covered with fog.

If we hit Finistère after 2,000 miles of almost blind flying, we certainly ought to be able to reach Paris, a few hundred miles off.

We were using the earth-induction compass and it had been excellent to steer by, better than the ordinary magnetic compass. The pilot had before him the pointer of the earth-induction compass, which was supposed to synchronize with a pointer in the navigator's compartment. A number of times I found my pointer considerably off and at first I blamed it on the pilot, but found that one of the pointers apparently was sluggish and sticky. We would tap the dial and by checking with the standard compass we always managed to get on the course again.

I always take two or three compasses on an important trip to check for accuracy. In spite of a few minor mechanical difficulties, the earth-induction compass undoubtedly is the aviation compass of the future.

About the time we expected to hit Paris we got temporarily out of the thick weather. I saw bright lights ahead and a flashing light which I at first mistook to be Le Bourget. My astonishment was great when I found that the flashing light was a lighthouse on the coast of France!

A DISAPPOINTING DISCOVERY

The compass had taken us in a circle. By the flares of our flash lights, I conferred on paper with the pilots and concluded that we had made a circle to the left. There had either been some local affection of the compass in the plane, or the pilot's dial had stuck badly. The only way to get on again would be to lay some course and check up the compasses.

We tapped the dials, checked them with the extra standard compass we carried, and they then checked O. K. I watched the course carefully after that and checked compasses every few minutes. I knew we were heading toward Paris. The inky darkness was broken occasionally by the flashes of our lights as we needed them temporarily, and the fire from the engine

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COMMANDER BYRD HONORS FRANCE'S UNKNOWN WARRIOR

The American aviators' first visit at Paris was to this shrine beneath the Arc de Triomphe, which corresponds to our tomb of the Unknown Soldier at Arlington National Cemetery, near Washington, D. C. Commander Byrd laid a wreath of bronze upon the Warrior's tomb, on which burns the *Flamme du Souvenir*, a fire first lighted November 11, 1923. At the extreme right are Lieut. George Noville and Bernt Balchen, two of Commander Byrd's aides on the flight, and to the left is seen his pilot, Bert Acosta.

exhaust pipes. The rough air made it a little difficult to steer, especially in the darkness, but we kept a pretty good general course.

IN REACH OF PARIS COAL, BUT HAD TO TURN

Then arose the necessity of watching the gasoline very carefully, for a forced landing in the darkness would not only have meant certain disaster for us, also for some of those, perchance, beneath us.

Finally, we got to the point beyond which, if we had continued, we could not have returned to the coastal waters, on account of the diminished gasoline. We knew that we would need a few gallons of reserve in order to cruise around for a suitable landing place. I believe at the moment we turned we were near Paris; our motors were heard at Le Bourget through a sound intensifier, but I could not flirt any more with the lives of my shipmates.

It would probably be difficult for the layman to visualize our predicament, tossed around in the inky darkness of the storm, drenched by rain.

However, that decision to turn back did not carry safety with it. It meant that even should we find water we could not be certain of landing without disaster, because I never heard of anyone landing in the water when it was pitch dark and when the water could not be seen. We could not even be certain of landing a great plane like ours safely in the water in the daytime.

So, when we turned, we faced uncertainty ahead, but there was nothing else we could do under the circumstances that would give us any chance whatever to save the lives of the crew and to avoid endangering the people beneath us.

We set a course for the lighthouse we had seen. The wind might blow us off a bit in the darkness, but if the fog were not

too thick there, we were confident of hitting it. Much of the way we could see nothing beneath us, and we were flying so low that Noville had to pull in the antenna of his wireless to prevent it from hitting objects on the ground. Finally, when I thought we were near the lighthouse, I asked Balchen to get down lower. We emerged from the mists and there was the lighthouse ahead of us, and the brilliantly lighted town we had taken for Le Bourget we now thought was some amusement resort (see page 362).

DECIDE TO COME DOWN IN WATER AND SWIM ASHORE

We cruised over it slowly, but in spite of the lights the area around it was black, and we could only guess its topography. We could find no landing place. We had hoped there would be a beach and had written out a message on a weighted streamer asking the people to clear the beach and make some kind of light for our landing.

We then flew over the lighthouse and, by the quick flash of the revolving beacon, we could tell that we were over water and dimly distinguish the shoreline. We could not discern the character of the beach. It was still raining and dismally thick.

We decided to land near enough to the beach line to swim ashore, if necessary, and to salvage the plane, if it were not too badly wrecked. At the same time we had to be far enough away to miss any rocks, should the beach be rocky. That, of course, we could not tell.

We had some navigation flares with us which ignite upon striking the water and give a light for a few minutes. We carried these to sight on at night, when over the ocean, to get the drift caused by the wind, but we had been unable to use a single one. I had thrown half of them overboard to rid us of the weight, but had saved enough for such an emergency as this.

We now dropped a number of flares as nearly in a line as we could, about 100 yards from the beach line. They all ignited, and although they made a light in a pool of blackness, we hoped we would be able to judge the distance of the plane above the water as we descended. Of course, if we could not judge it, we would go into the water at flying speed, which would smash everything badly, since water does not give much when hit hard (see text, page 363).

Those hours in the black storm had not been pleasant. I felt myself entirely responsible for the lives of my shipmates. I don't believe they thought there was much chance of getting down safely, but still they faced gallantly, with steady courage, whatever fate lay ahead. In a few moments the story would be ended, but to the last they calmly obeyed orders.

Balchen happened to be at the wheel. I gave the orders to land.

We were landing with the plane in control and the engines functioning perfectly. At that moment, in spite of our danger, I marveled at the three engines that for 42 hours had made some 1,500 revolutions a minute without missing a beat. I thought of the Wright Aëronautical Corporation, that made the engines, and of my friend, Charles Lawrance, who had designed them.

As we neared the water we could not see it; only the flares ahead of us and beneath us.

The wheels touched, and though the landing gear is secured to the plane with a tremendous factor of safety, it was sheared off, along with the wheels, with hardly a jar of the plane, as though a great knife had cut it, thus demonstrating the tremendous resistance of the water when hit by a rapidly moving object.

AND THEN, THE CRASH!

It seemed just a second after that the crash came. I suppose I was dazed a little. I know I got a pretty stiff blow over the heart. I had been looking out of the cabin window and found myself in the water outside. Of course, it was pitchy dark and still raining. I could hear Noville calling for me, but not another sound in the extraordinary stillness which contrasted so vividly with the roar of the great motors which had been pounding on our eardrums for 42 hours like tom-toms of Hades—the contrast made the stillness deathly.

The plane had instantly filled with water. Noville was getting out of the window. I yelled at him that I was unharmed and asked him how he was; there was no an-

swer. I was a little worried about him, but I knew that he could not have been badly hurt. Hearing nothing from Balchen and Acosta, I swam to where they had been; the cockpit, of course, was under water. I yelled as loud as I could but got no answer, and was naturally very apprehensive.

I found Balchen slightly caught under water and trying to extricate himself. When he got clear I yelled to him but received no answer, and concluded that he, too, was somewhat dazed. Thinking that Acosta must have been caught under the water in the cockpit, we dived down, but he was not there. I yelled for him, but there was no answer. A moment later he appeared, apparently from nowhere, swimming toward the wing, the leading edge of which was now down to the water.

It was a weird sensation to have three shipmates so dazed there in the dark that they could not hear, but it was the most thankful moment of my life to find them still "kicking." Then with grunts and groans we dragged ourselves upon the wing.

Noville, still functioning perfectly, was carrying out his orders given before leaving the States, which were to rip open the emergency cabin in case of landing in the water and pump up the rubber boat. He was at his job, although he could hardly stand up and was falling every minute or two (see illustration, page 355).

It had been with considerable difficulty that all hands got on top of the wing. I then found that the reason I could not get any answer from them was that the three engines roaring for 42 hours over their heads had temporarily deafened them. I had used ear protectors and my hearing was normal.

The great question was solved at last. We could land without injuring seriously the personnel. The plane did not turn over, as many thought it would, and we had placed the emergency compartment in about the only situation in the ship where we could get at our rubber boat and other emergency supplies when landing in the water.

My next thought was one of great admiration for Balchen's landing. My mind turned to Norway, which had produced this kind of a soul, cool and courageous in emergency.

We were stiff and bruised, tired and water-soaked, and it was with some difficulty that we pumped up the rubber boat. As the wing was almost flush with the water there was no difficulty in launching it (see illustration, page 356).

We had placed our most precious cargo, which included a piece of the original American flag, in a compartment we had made in the great wing; this we thought was the safest place. After finding the things in there were only slightly wet, we shipped the oars in the rubber boat, and wearily made for the shore in the dark.

WEARY FLYERS KNOCK VAINLY AT MANY DOORS

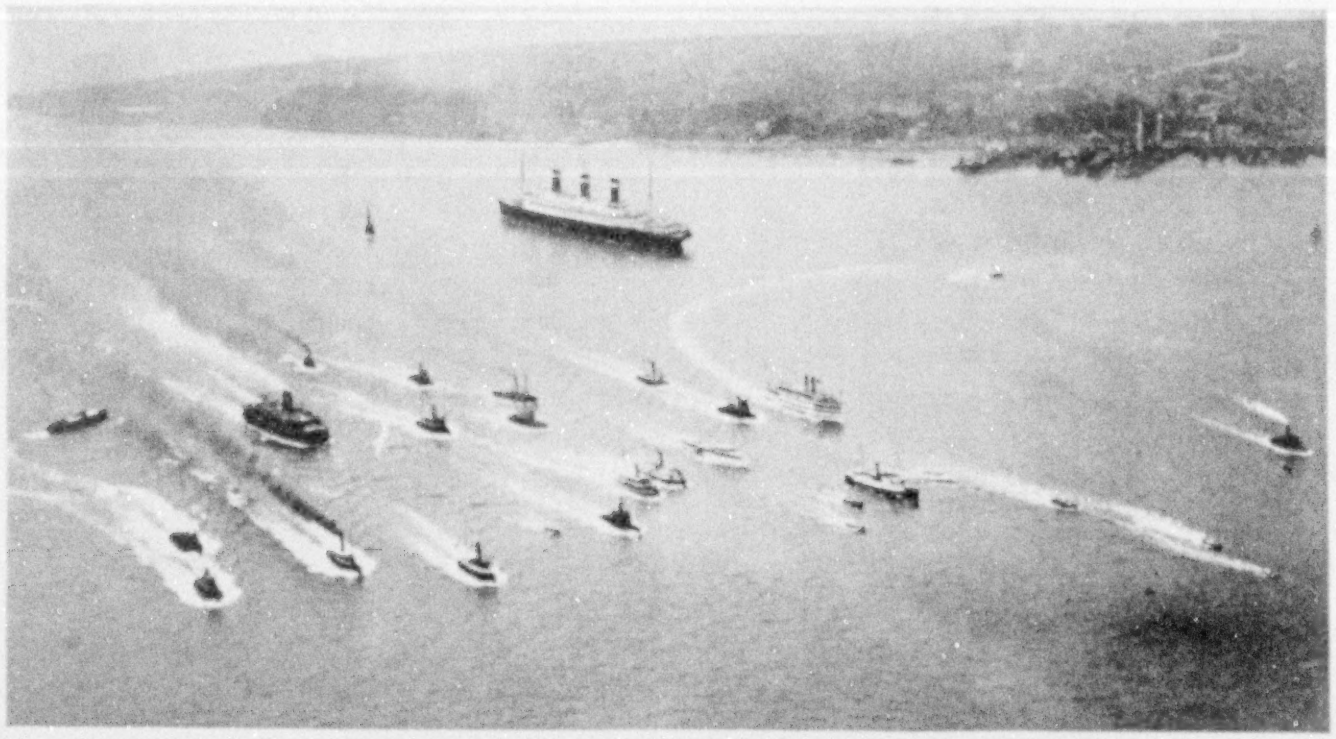
We were a mile from the village, and even after we reached it we spent much time going from house to house trying to arouse someone. But there were fences with locked gates around these houses and we were unsuccessful. Suddenly, a boy on a bicycle passed us, but he must have thought we were dangerous tramps, for he hurried on. Wet and bedraggled, we certainly were not prepossessing.

Finally, we found the lighthouse keeper and his wife awake. At first they seemed to think we were crazy, but when at last they realized that we had landed at Ver-sur-Mer, having come all the way from America, their astonishment and excitement were intense.

Here began an experience with the people of France which was so remarkable that I don't believe it could ever be duplicated.

Balchen and I left Acosta and Noville there while we went back to the *America* to get the mail and to salvage what we could of our precious records. In the meantime the tide had been going out rapidly, and when we reached the plane it was nearly high and dry. Some of the villagers appeared and helped us carry our records and a few other belongings up to the village. So long as we live we can never forget the kindness of the people of Ver-sur-Mer, and before leaving France we motored back there to tell them "good-bye."

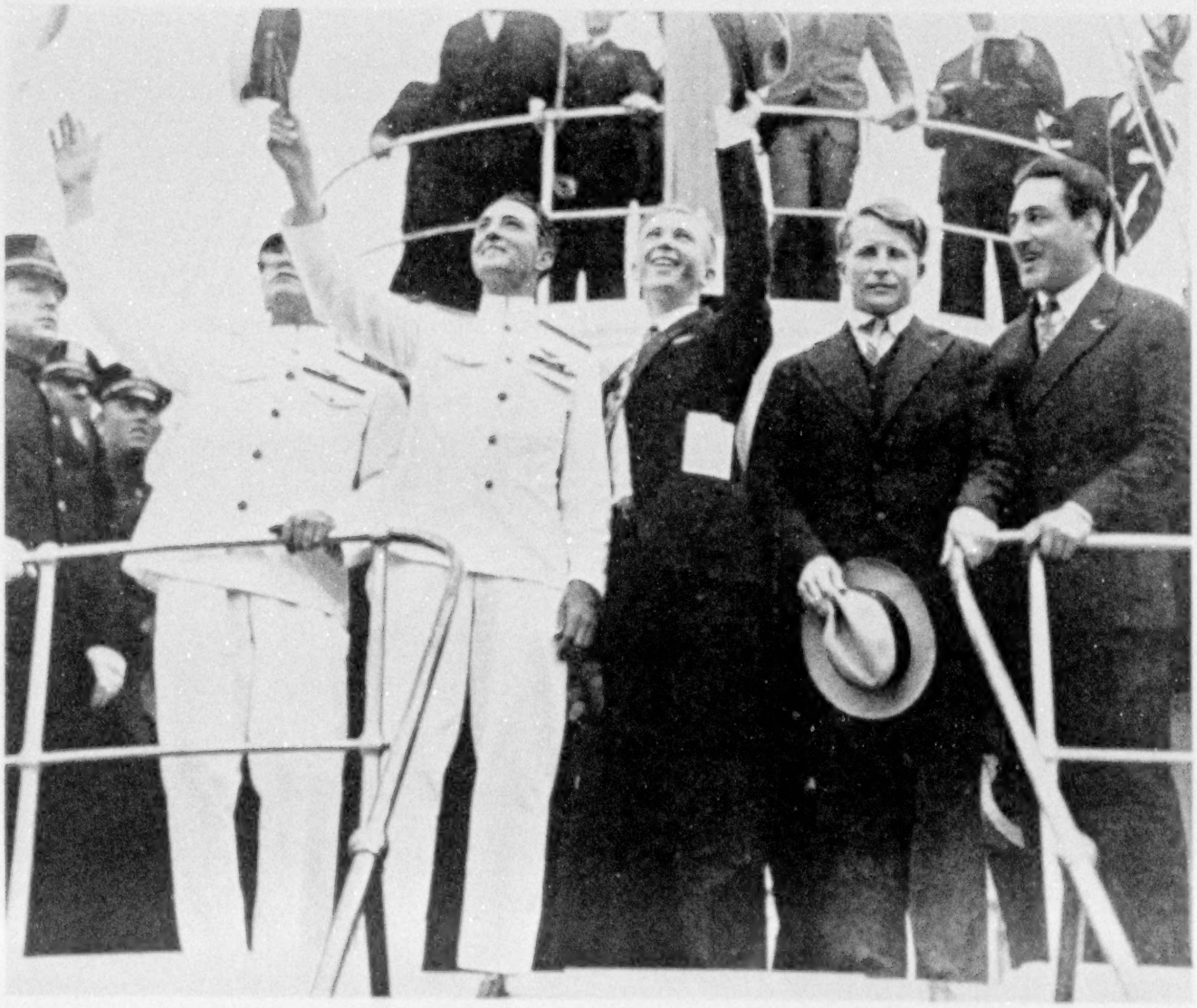
The wild scenes of joy and welcome which we received wherever we went in France are far beyond my power to describe. When we arrived at Paris, it was



Photograph from Pacific and Atlantic

THE FLYERS LEAVE THE "LEVIATHAN" AMID SHRIEKS OF SIRENS

This air view shows the parade of tugs and excursion boats that escorted the aviators through upper New York Bay to the Battery.



Photograph from Wide World

FIVE FAMOUS AIRMEN RETURN TO AMERICA

The aviators aboard the *Macom* are (left to right): Lieut. George Noville, Commander Richard E. Byrd, Clarence D. Chamberlin, Bernt Balchen, and Bert Acosta.

a long time before we could get away from the station. The entire city seemed to have turned out to welcome us. The people were mad with joy at our escape, though yet mourning the loss of their own beloved airmen.

The glass in one of our automobiles was broken, and the machine in which I was riding was almost upset several times by the crowds that surged against it. Some of the people must have been crushed and injured, but they did not seem to mind. We could not start the automobile engines, but were simply shoved along by the crowd.

It seemed to us that if everyone in France had been our blood relatives we could not have received a more joyous welcome.

From the greatest statesmen down to their humblest citizens, we received warm expressions of admiration and friendship, but their words were not necessary to show us how they felt. The expressions on their faces were more eloquent than any words could have been. France gave us her very best.

The crew of the *America* wishes to say to America there can be no doubt about the deep friendship of France for the people of this country. When one of their gallant airmen flies to our shores, we must give him the reception we received from France.

France saw in us, for the moment, the embodiment and the spirit of America, and it was that for which they poured out their friendship and affection. They were saluting the Stars and Stripes which we for the moment carried and we felt humble and grateful that this revelation should have come to us. *Vive la France!*

We must acknowledge here the kindnesses shown us by Dr. Herbert Adams Gibbons, Mr. Wanamaker's representative; Captain Richard D. White, Naval Attaché at Paris, and Mr. Sheldon Whitehouse, Chargé d'Affaires at the American Embassy there.

It may be well to give a brief summary of some of the things which we hope will indicate the way for pioneers who must follow us.

I am glad now that we had extremely adverse weather, for I believe, from what we have learned, the airplane of the future can shove off with almost any weather conditions. For, when a storm is blowing across the Atlantic, it will be able to fly at that side of the storm center which will give strong winds in its favor. We did just that. We were greatly helped by flying along the southern end of a storm area, and the northern end of a high-pressure area (see text, page 359).

Then when the transatlantic plane of the future strikes near the center of a storm area, as we did over France, there will be radio direction finders to enable flyers to locate the exact position of their plane, regardless of fog, winds or rain, or the darkness of the night. Radio beacons will be erected to guide the aviator to his destination.

WHY LANDING PLATFORMS ARE NOT YET PRACTICABLE

A chemical will be invented which will disperse the fog, or a beam of light will be discovered that will penetrate it. Until that time comes, landing platforms in mid-Atlantic are not practicable.

I am happy to say that the Transatlantic Meteorological Service, which has been started as a result of our flight, will be permanent and probably will reach such a degree of efficiency that the flyer will not only know what weather he is to encounter, but even if the navigator is lost in the clouds or in the fog, as we were, he will be able to predict, with a considerable degree of accuracy, in just what direction the winds are blowing him off the course. We were able to do that with the limited knowledge we now possess of transatlantic meteorological conditions.

The flyer of the future will find the shortest route to Paris at varying altitudes, depending upon the local weather conditions, because the winds change, both in strength and velocity, with changes of altitude. But when the great plane of the future reaches the Atlantic Ocean beyond Newfoundland, the navigator will probably go up into high altitudes, where he is almost certain to obtain very strong winds with him, owing to the revolution of the earth. He will be able to increase his speed by as much as 40 or 50 miles an hour; almost the speed of an express train. That is not a wild dream, because we increased our speed between 20 and

Photograph from Wide World

NEW YORK WELCOMES RETURN OF FLIGHT HEROES

Rain failed to dampen the ardor of Gotham's acclaim of Commander Byrd and his courageous crew, when they arrived together on the *Leviathan*, July 18, 1927. They proceeded up Broadway to City Hall, where they were officially greeted amid the cheers of thousands of people.

30 miles an hour by flying at about a two-mile altitude.

The air navigator of the future will be in constant touch by radio, and there will be radio stations to give him accurate information of weather all along the route, so that he can alter his course to get the maximum advantage from the wind.

He will have flares, which will ignite upon hitting the water, for getting his wind drift at night, and he will have powerful candle parachute flares which will light up the surrounding country in case of a necessary landing at night.

We believe that the *America* possessed all the essential qualifications in itself for a safe transatlantic flight. What must be done now is to build a similar plane of twice its size, establish a meteorological organization, and provide large concrete take-off and landing fields and radio beacons and direction-finding stations all along the land part of the route, especially at the landing base. When this is done, I would not hesitate to take with me across the Atlantic my closest friends or relatives.

We feel that our fight with the elements and our labor and preparation are well worth while if we, even in a small degree, helped the progress of aviation and international good-fellowship.

A sparkle in every spoonful

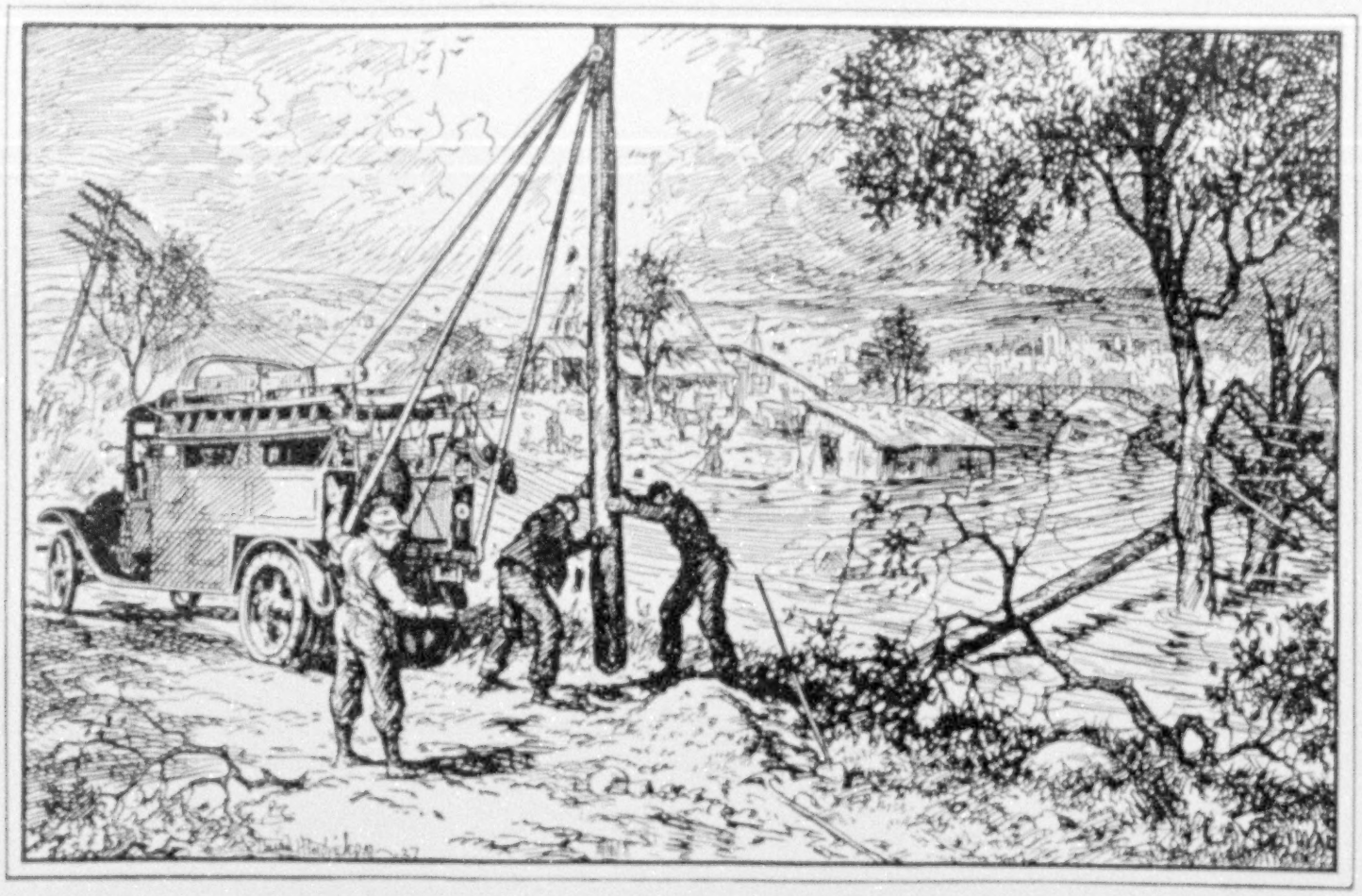
This is a soup with a flavor and sparkle all its own. No other soup is like it. There's glow in it. It arouses the most indifferent appetite with its individual and irresistible taste. Each spoonful only serves to add to your satisfaction. You feel revived and refreshed.

Campbell's, with their strict standards of quality, their skill, their experience and their superb kitchens, select just the best portions of the finest tomatoes and blend and cook them into a soup that brings you all the sunny tomato goodness.

LOOK FOR THE RED-AND-WHITE LABEL

No tomato is plucked until the sun has ripened it and sweetened it to the very heart, right as it grows on the vine. Then when it hangs—a ruddy and luscious temptation—laden by nature with tonic nourishment—it is plucked and brought to the Campbell's kitchens—there to be blended with golden butter and the daintiest seasoning, by Campbell's famous French chefs. 12 cents a can.

WITH THE MEAL OR AS A MEAL SOUP BELONGS IN THE DAILY DIET



All for One

An Advertisement of
the American Telephone and Telegraph Company

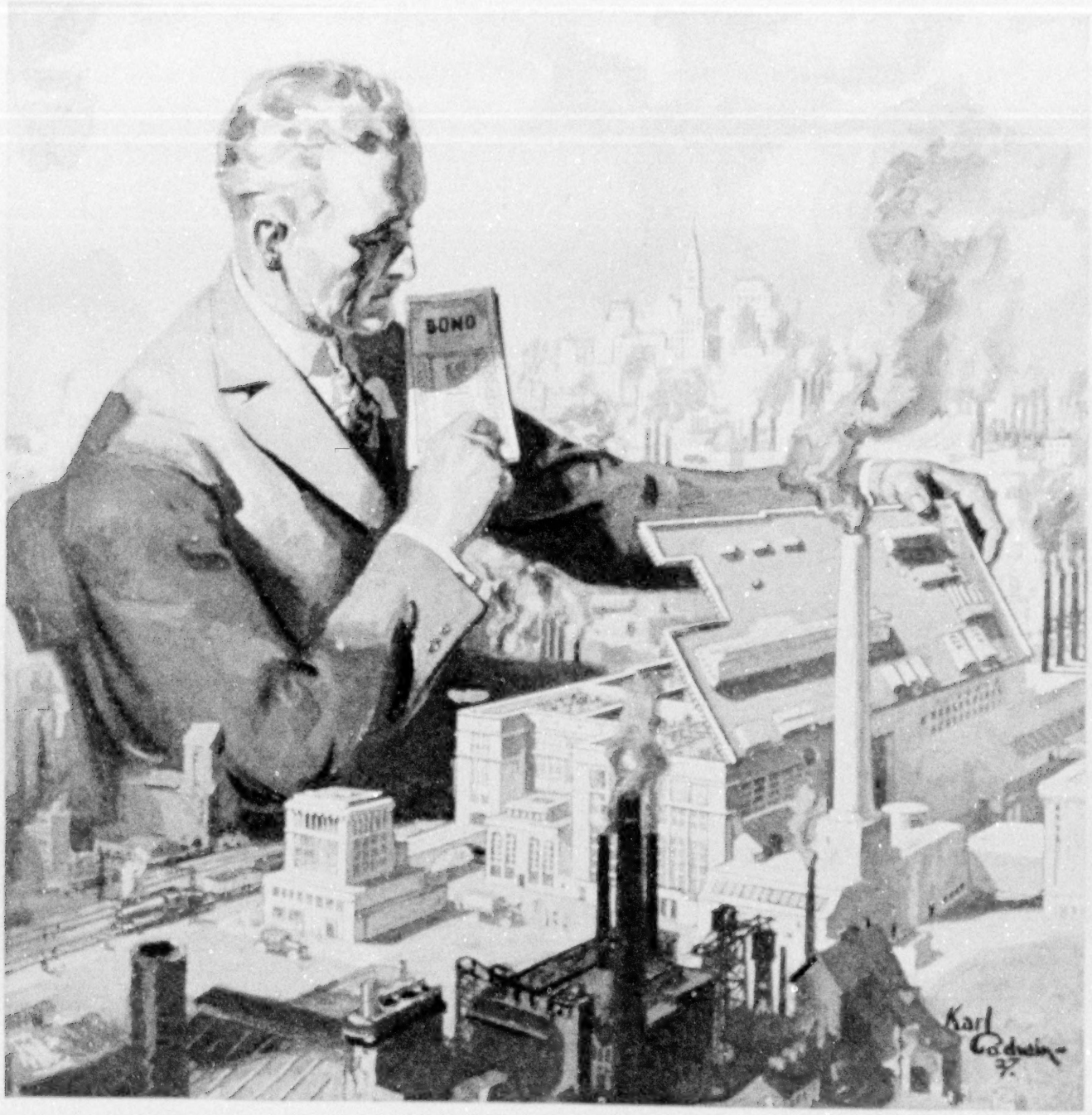
A SLEET storm descends, carrying down trees and wires. A wind turns outlaw and blows down a pole line. Or some swollen river rampages through a circuit of destruction.

But wherever angry nature attacks the Bell Telephone System there are repairmen trained to meet the emergency, and everywhere trained in the same schools to the use of the same efficient tools. Supplies of surplus equipment and materials are kept at strategic points whence they may be rushed by train or truck to the devastated area.

Throughout the Bell System, all construction and practice are standard, so that men and supplies, when necessary, may be sent from one state or company to another.

There are twenty-five Bell Companies, but only one Bell System—and but one Bell aim and ideal; stated by President Walter S. Gifford as:

"A telephone service for this nation, so far as humanly possible free from imperfections, errors and delays, and enabling anyone anywhere at any time to pick up a telephone and talk to anyone else anywhere else in this country, clearly, quickly and at a reasonable cost."



—*for up-to-date facts*

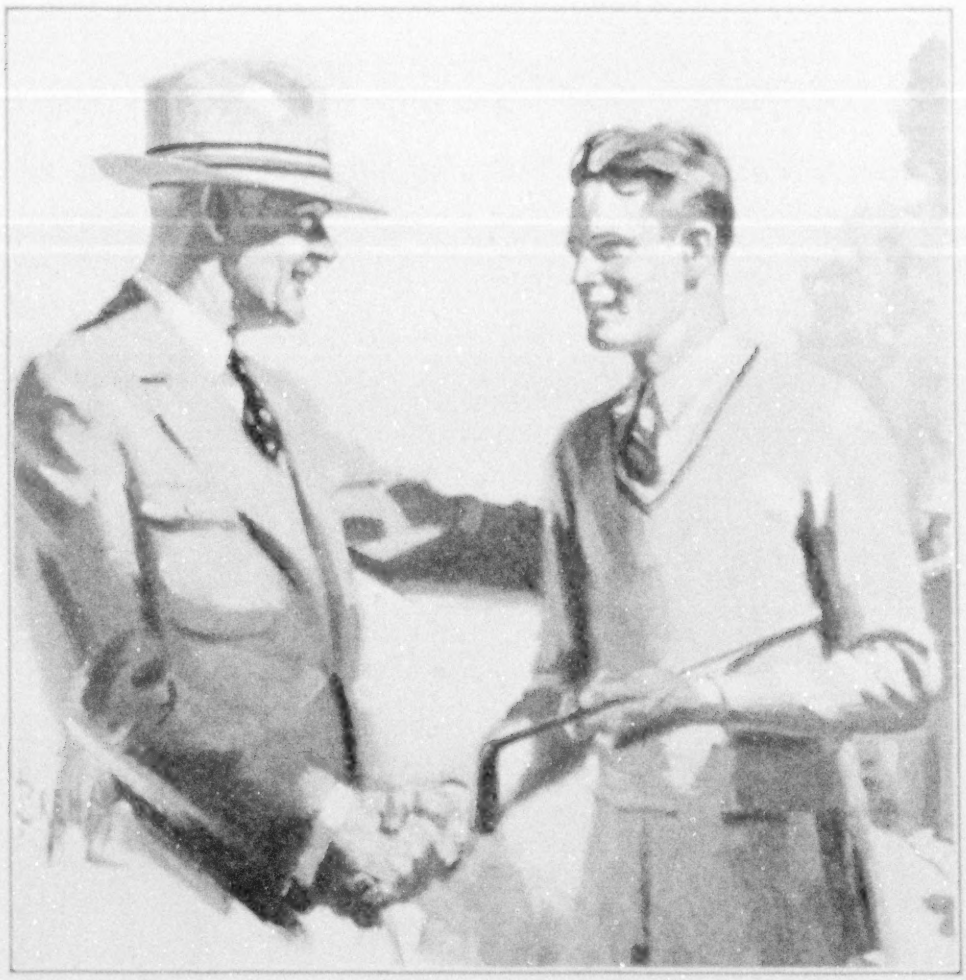
THE NATIONAL CITY COMPANY
NATIONAL CITY BANK BUILDING
NEW YORK

Because even the best of bonds may be affected by changing conditions, an occasional check-up is a sensible precaution. A slight revision of holdings may be advisable to strengthen your investment position. Vast stores of up-to-date facts on investments are available to you at National City offices in fifty leading cities. Our experienced bond men will analyze your present holdings or help you select additional investments.

The National City Company

National City Bank Building, New York

OFFICES IN 50 AMERICAN CITIES · INTERCONNECTED BY 11,000 MILES OF PRIVATE WIRES · INTERNATIONAL BRANCHES AND CONNECTIONS



Men win with

FACES that are FIT

BEGIN the day with Williams. Keep *your* face FIT! 87 years of research, three generations of intensive specialized study have gone into every tube of Williams. It will give a shave that's easy and smooth.

More—a daily treatment of Williams lather leaves your face *fit*. Williams Shaving Cream is ultra-pure; absolutely without trace of coloring matter; its major ingredients triple-distilled. It thoroughly cleanses the pores, tones up the delicate skin structure, helps toward a buoyant, youthful fitness.

The drug clerk doesn't know how it's made, but he knows what it does. *"Oh, yes . . . . . but they all come back to Williams!"*

Next time say

Williams Shaving Cream

please!

Afterwards, a dash of Aqua Velva. FREE sample of this, too, if you say so on your postal.

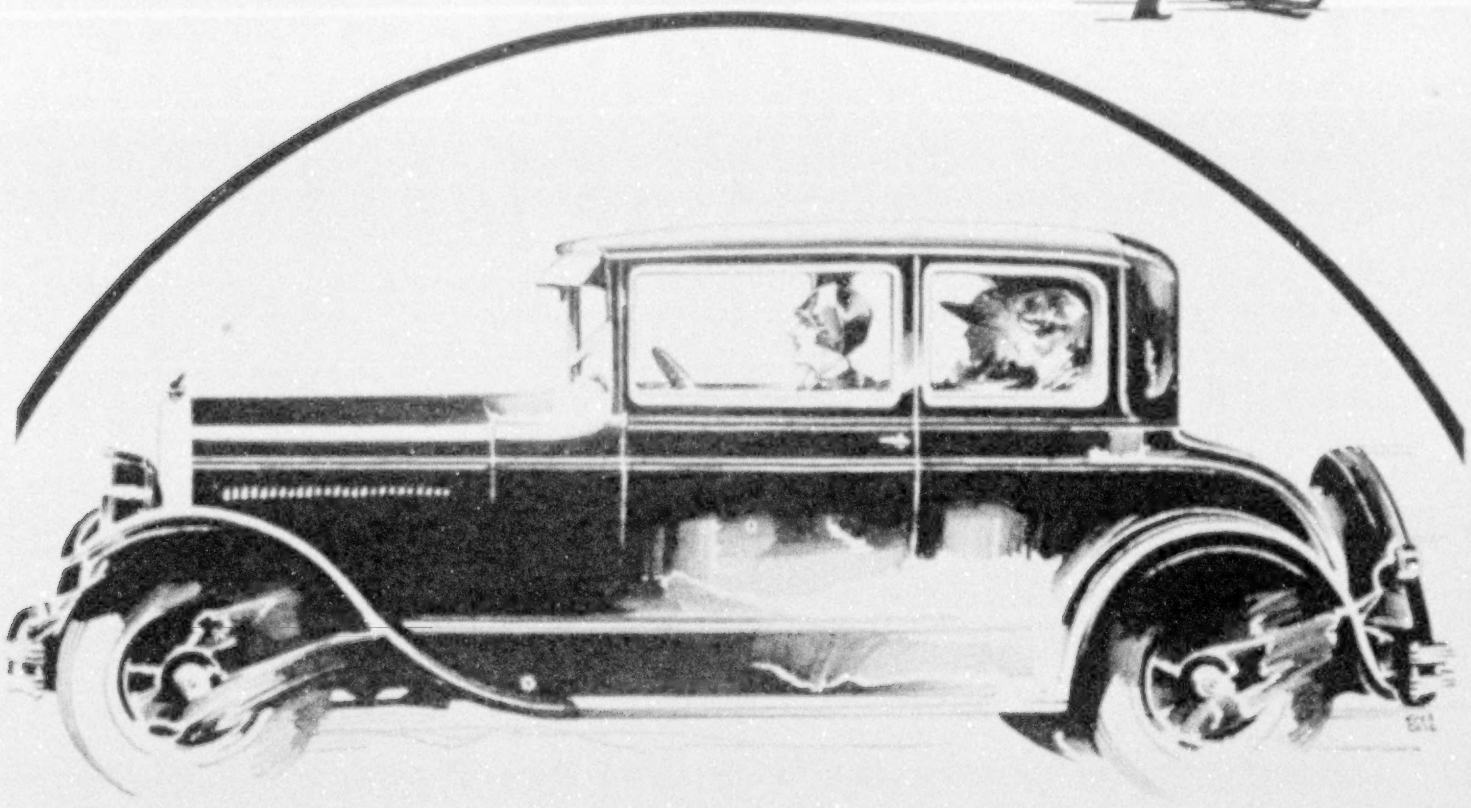
FREE TRIAL SIZE

WRITE "Shaving Cream" on a postal and address:
The J. B. Williams Co., Dept 59, Glastonbury, Conn., U. S. A.
(Canadian Address: 1114 St. Patrick Street, Montreal.)

If you don't like to bother with samples, buy from your nearest drug store; two sizes, 35c and 50c.

THE ILLUSTRIOUS NEW

CHRYSLER 72



Longer, Roomier, Faster Handsomer

IN THE illustrious new "72"—modern as the next minute, longer, roomier, faster, handsomer, and with performance and riding results never before achieved—Chrysler excels even Chrysler in its appeal to discriminating motorists.

You probably can't even imagine out of your past experience a car that handles more easily at 70 and 72 miles than most cars do at 45—

That flashes from 5 to 25 miles an hour in 7 seconds—That takes even mountain grades at constant acceleration, and makes you totally unconscious of all ordinary hills—That rides as softly as a down pillow, over brick, cobblestone or rutted dirt—That is beautiful and luxurious beyond description—

You can't imagine such a car because there never has been such a car in its class as the Illustrious New Chrysler "72".

Eight body styles, $1405 and upwards, f.o.b. Detroit, subject to current Federal excise tax.

New Chrysler "Red-Head" Engine

For those who seek supreme performance—speed, pick-up, hill-climbing ability, going beyond even the qualities of its standard sixes—Chrysler furnishes its new "Red-Head" high-compression engine . . . The new Chrysler "Red-Head" will be regular equipment on the Illustrious New Chrysler "72" Roadster, giving even greater speed and acceleration than the standards announced. It is also available for all other "72" body models.

CHRYSLER MODEL NUMBERS MEAN MILES PER HOUR

High compression cars are here at last!

THE ADVENT of Ethyl Gasoline has in the last year brought a new standard of automobile performance to hundreds of thousands of car owners. As an Ethyl user, you have had the benefits of greatly increased speed, more power on hills and heavy roads, quicker acceleration, and complete elimination of "knock."

But the real high compression automobile is here at last!

Ethyl Gasoline has made it possible!

Ride with Ethyl in a high compression motor and get the thrill of a lifetime. Ethyl Gasoline is available throughout the United States and Canada at pumps which display the "ETHYL" trademark.

ETHYL GASOLINE CORPORATION · 25 Broadway, New York

ETHYL GASOLINE

ETHYL
ETHYL GASOLINE CORPORATION
Knocks out that knock

What should North bid?

This is the fourth set of six hands in a series of Bridge bidding problems by Milton C. Work.

In each of these hands, South (the dealer) has already bid one spade. West, the second player, has passed. You, as North, are asked to decide how you would bid each of the hands shown below, your partner having opened with one spade. Send in your bids before November 1st. All those who bid these hands correctly will receive valuable prizes. Send bids to Bridge Contest Dept., A. H. Heisey & Co., Newark, Ohio.

Hand No. 19
♠ J-9
♥ A-K-Q-3
♦ A-K-Q-9-8
♣ J-5

Hand No. 20
♠ 3-2
♥ 6-4-2
♦ Q-J-10-8-5
♣ 7-6-3

Hand No. 21
♠ J-8
♥ 8-7-4
♦ K-Q-10-8-5
♣ 5-4-3

Hand No. 22
♠ J-8
♥ 4-3-2
♦ K-Q-10-7-5
♣ A-10-3

Hand No. 23
♠ 6-3-2
♥ A-K-5-3-2
♦ A-K-Q-J-8
♣ None

Hand No. 24
♠ K-5
♥ A-10-2
♦ Q-10-6-3
♣ K-10-7-4

Dainty Glassware *for all Occasions*

Graceful designs . . . delicate colors . . . appropriate patterns . . . in an almost inexhaustible variety of exquisite pieces. These you will find in the fine glassware fashioned by Heisey.

Sparkling goblets of fascinating design . . . delicate sherbets, parfaits and fruit cocktails . . . alluring flower bowls and candlesticks; yes, cups and saucers, as well as demi-tasse . . . soups and bouillons, an incomparable selection of plates and scores of other useful and decorative pieces.

And one need not be confined to crystal. There are also bewitching colors . . . the rose of Flamingo, the green of Moon Gleam, the amethyst of Hawthorne . . . to match one's mood or decorative scheme. You can have different colors for different occasions.

The better stores . . . those which are particular about the service they render . . . universally handle Heisey's (H) Glassware. The genuine can always be identified by the (H) trade mark, the symbol of quality in glassware for more than three decades.

The illustrated booklet, "Gifts of Glassware," will be mailed free on request

A. H. HEISEY & COMPANY
Newark, Ohio

HEISEY'S (H) GLASSWARE *for your Table*

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♥ 8-7-4
♦ K-Q-10-8-5
♣ 5-4-3

Hand No. 22
♠ J-8
♥ 4-3-2
♦ K-Q-10-7-5
♣ A-10-3

Hand No. 23
♠ 6-3-2
♥ A-K-5-3-2
♦ A-K-Q-J-8
♣ None

Hand No. 24
♠ K-5
♥ A-10-2
♦ Q-10-6-3
♣ K-10-7-4

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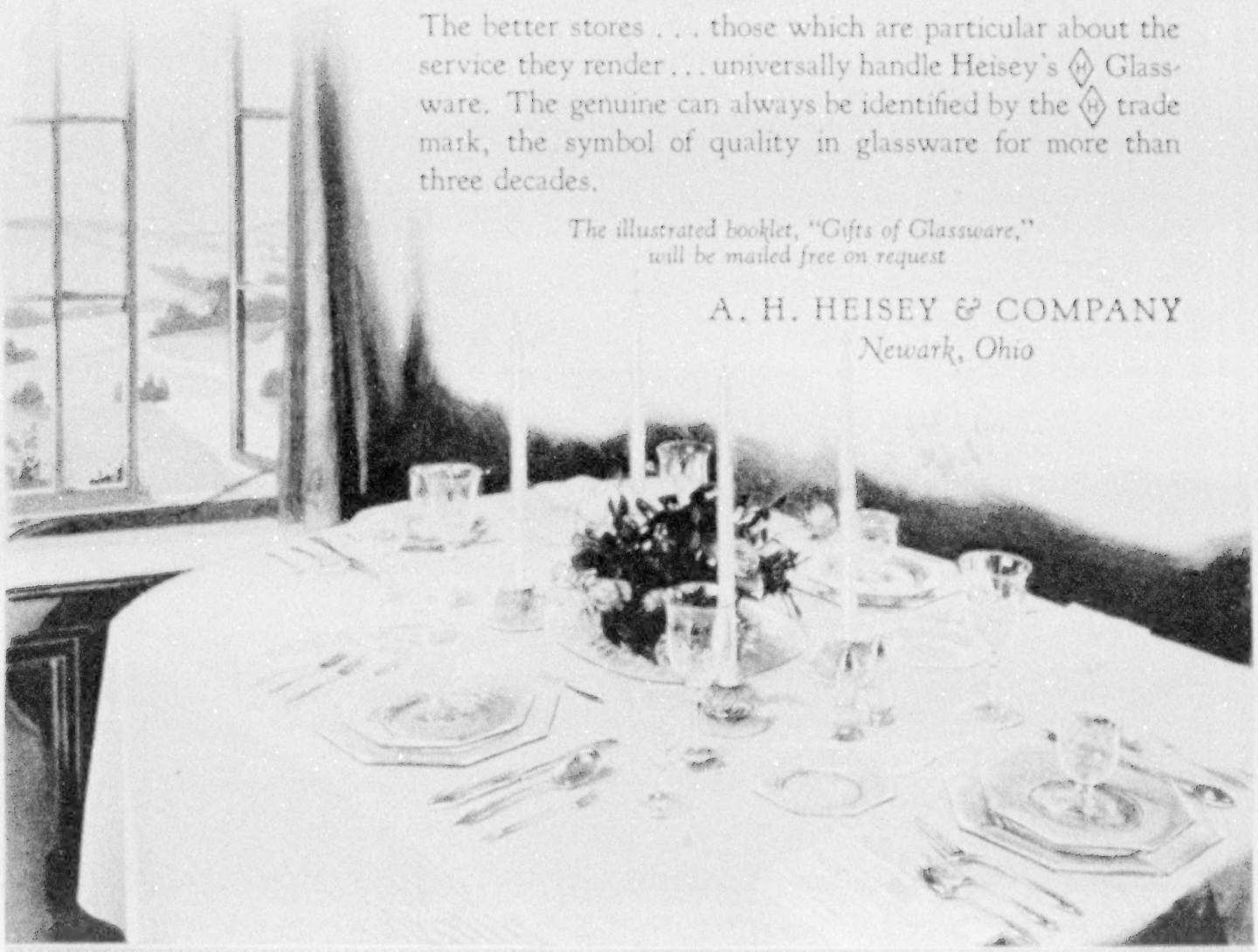

HEISEY'S ◇H◇ GLASSWARE *for your Table*

MODEL 1115

CABINETS BY

Seeger

SAINT PAUL

The All Porcelain Cabinets by Seeger built exclusively for Electrical or Gas Refrigeration feature Vegetable Storage Compartment; CHILTRAY; No Drain.

Offered to discriminating people by leading systems of Electrical or Gas Refrigeration.

Cabinets by Seeger for use with ice, or for commercial use are sold by usual representatives.

SEEGER REFRIGERATOR COMPANY

New York—Boston—Chicago—SAINT PAUL—Los Angeles—Atlanta—Seattle

STANDARD OF THE AMERICAN HOME

MODEL 1115

CABINETS BY

Seeger

SAINT PAUL

The All Porcelain Cabinets by Seeger built exclusively for Electrical or Gas Refrigeration feature Vegetable Storage Compartment; CHILTRAY; No Drain.

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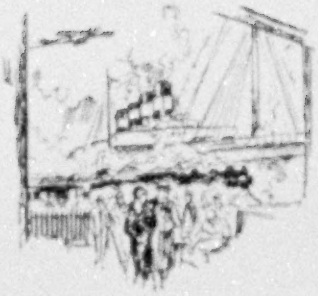
SEEGER REFRIGERATOR COMPANY

New York—Boston—Chicago—SAINT PAUL—Los Angeles—Atlanta—Seattle

STANDARD OF THE AMERICAN HOME

Resinol Soap for the woman who travels



gives a sense of exquisite cleanliness, while its Resinol properties protect the skin against dryness and roughness

YOU are thrilled at the thought of the coming trip. For weeks—perhaps months—you have been studying maps and schedules. Gowns, hats, and all the accessories have been selected carefully to make you look your best on all occasions, but how have you planned to protect your skin in the strenuous days to come?

It is so easy to spoil the effect of the loveliest gown by a rough, red, grimy complexion. Yet the dust of travel and the daily rush for trains, boats, or motors, with little time for the care of the skin, conspire to produce just that result.

There is no space to give to an array of cosmetics, and no time to use them if she had them, so the experienced traveler safeguards her skin with a product that will meet all the requirements for thorough, yet quick and gentle, cleansing. She is wise when she selects Resinol Soap because—

It quickly yields a rich, sparkling lather in practically all kinds of water, thoroughly cleanses the tiny pores, and rinses easily.

It gives a delightful feeling of cool and refreshing cleanliness because of its distinctive Resinol fragrance.

But, most important of all, it contains the specific Resinol ingredients so favorably known through the other Resinol products—those ingredients which soothe the skin under all conditions, protect its natural oil, and keep it soft and velvety.

All druggists and toilet-goods counters sell Resinol Soap. Buy a cake today—try it a week, and you will want to enjoy it always, whether at home or abroad.

Prove these statements. Send 10c with the coupon below for the new and larger size samples of the Resinol products.

Send 10c for the new Resinol combination

DEPT 7-H, RESINOL, BALTIMORE, MD.

For the enclosed 10c please send me the larger size samples of the Resinol products and the Resinol Soap booklet.

Name .....

Street .....

City ..... State .....

Lantern-Lit JAPAN

BUDDHIST temples and Shinto shrines. Swinging lanterns . . . incense rising to the stars . . . sacred *saké* in a lacquered cup. It's Japan! The mystic, inscrutable Orient . . . all that you dreamed it to be! You fill your heart with the color and life . . . all the tiny spaces in your trunk with exquisite things bought for a song . . . and with a smile. Porcelains and prints; kimonos and curios! Countless little scenes and episodes, too . . . such pleasant memories to share with others.

You cross the Pacific in 10 days on palatial Express Liners . . . luxurious floating hotels, the choice of the travelwise! The largest and fastest ships on the Pacific . . . they sail frequently from Vancouver via Victoria to Japan . . . then to Shanghai and Hong Kong, the crossroads of the East. And on to Manila . . . a brilliant patchwork of mediaeval moats, monasteries and palaces, of languorous beauty under a tropical sun.

Always Carry Canadian Pacific Express Travelers Cheques

Offices in all large cities, including

New York, 344 Madison Ave. Chicago, 71 East Jackson
San Francisco, 675 Market St. Montreal, 141 St. James St.

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THE WORLD'S GREATEST TRAVEL SYSTEM

The
CRUISE OF 1928

SOUTH AMERICA AFRICA
MEDITERRANEAN · EUROPE

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"No: *I Learned it in 6 WEEKS!*"

HER employer laughed aloud. "Six weeks! You're joking, Miss Baker. No one could learn shorthand in six weeks. You have been with us about a month and you are by far the most competent secretary I ever had. Surely you don't expect me to believe that you gained your present speed and accuracy in only six weeks! Why—a great many of our stenographers have studied shorthand for ten months or a year or more and still they make a great many errors."

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For answer the girl handed the big business man her notebook.

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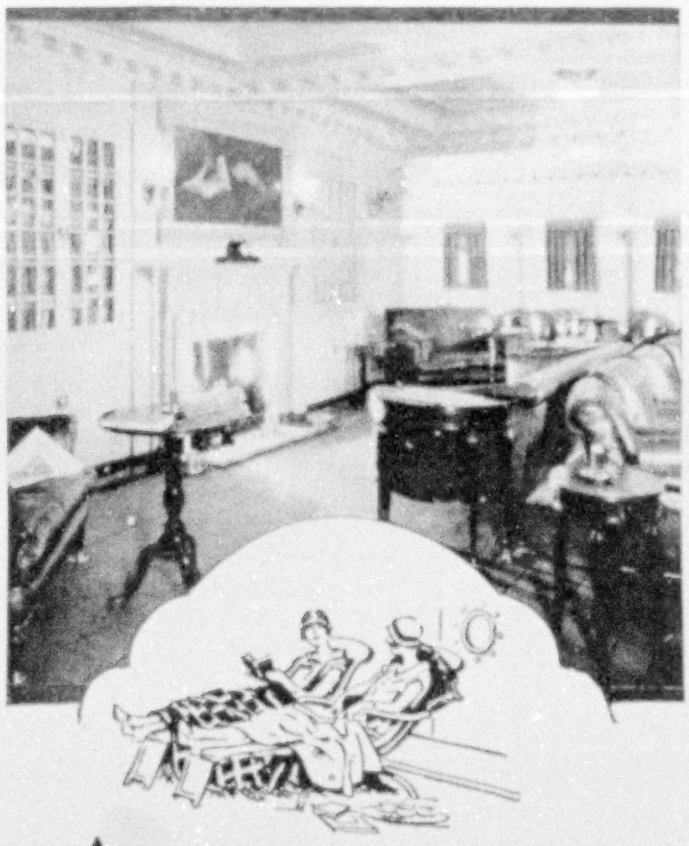

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(*Above*) IT'S THAT TWO-MINUTES-A-DAY that counts. Miss Margaret Mulhall is told by her dentist.

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Film, too, is the basis of tartar. And germs, with tartar, are a cause of pyorrhea. It absorbs discolorations from food and smoking. And thus makes pretty teeth look "off color" and dull.

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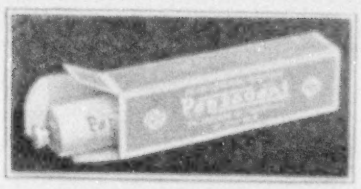

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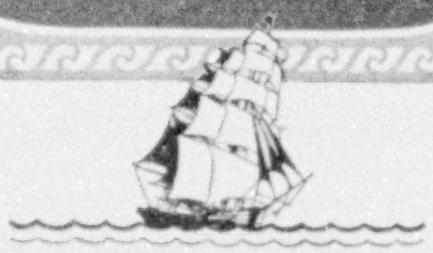

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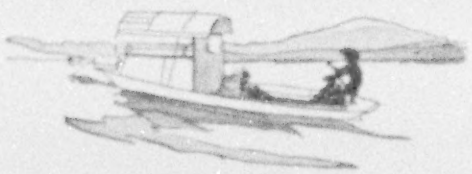

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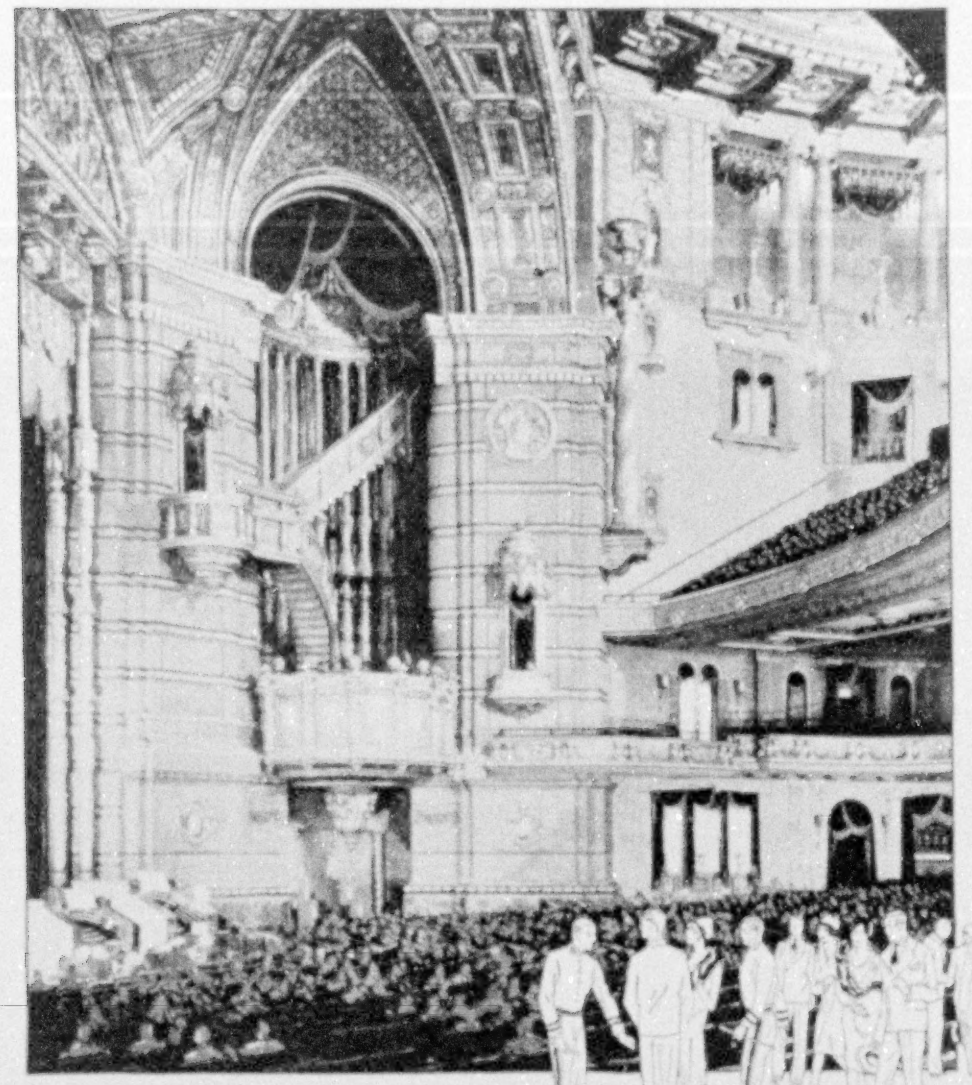

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NEW YORK

WALTER AHLSCHLAGER
Architect

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The hardest and best job of all is *keeping people happy* . . .

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TAKE the new Roxy Theatre in New York, for example. Walworth was called upon to supply all the valves and fittings for the heating and piping installations. But the job behind the mass of technical details of the specifications was *keeping people happy* . . . nothing else.

Thousands of pleasure seekers every day come to this great theatre as to a palace, in search of happiness. The street outside may be as hot as the Sahara. Their palace must be cool.

Or they come in out of a blizzard and find this whole enormous interior as warm as a cozy kitchen, from the orchestra to the farthest corner of the gallery. And why not? Walworth valves and fittings keep their homes, hotels, and offices comfortable, and isn't it just as easy to heat and ventilate a theatre holding 6200 pleasure seekers?

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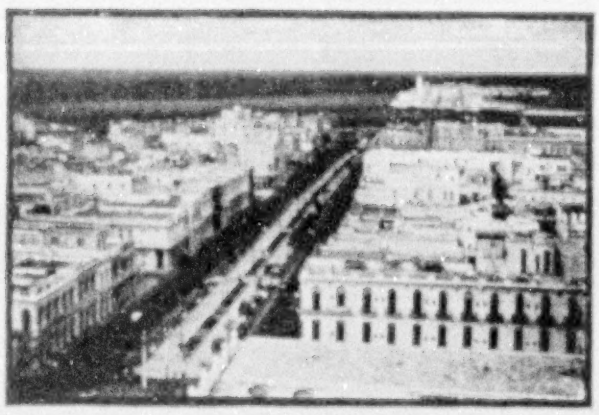

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Give Your Child This Important Advantage!

START your child's music study this Fall on a piano equipped with the Wessell, Nickel & Gross piano action! The *perfect balance* and *delicate responsiveness* of this action are of immense aid to little fingers in *daily practice* and in acquiring *correct habits of touch.*

Many different makes of pianos are equipped with the Wessell, Nickel & Gross action—the *world's highest-priced piano action.* And remember that this famous action is found only in instruments of recognized excellence. It is your guide to a satisfactory piano purchase.

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Successful interpretation of your personal suggestion in the form of beautiful and appropriate memorials is the result of McDonnell "special service."

A beautifully illustrated one-hundred-page booklet, undoubtedly the finest ever published, will be gladly sent free at your request.

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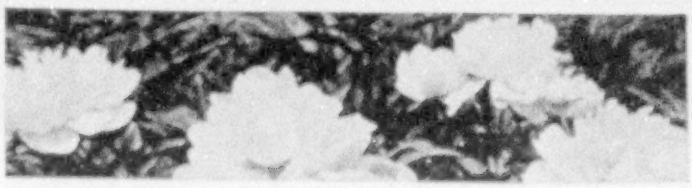
Brand Peonies Are Prize Winners



THE world's finest peonies can be grown to their full beauty of perfection if you plant Brand's superior varieties . . . the choice of peony lovers everywhere. For fall of 1927 Brand's Manual lists all the famous prize winners and superb tested seedlings. It contains full description, prices and instructions on peony culture that are the result of 60 years' experience growing these beautiful flowers. For free manual and price list address Box 44, Faribault, Minn.

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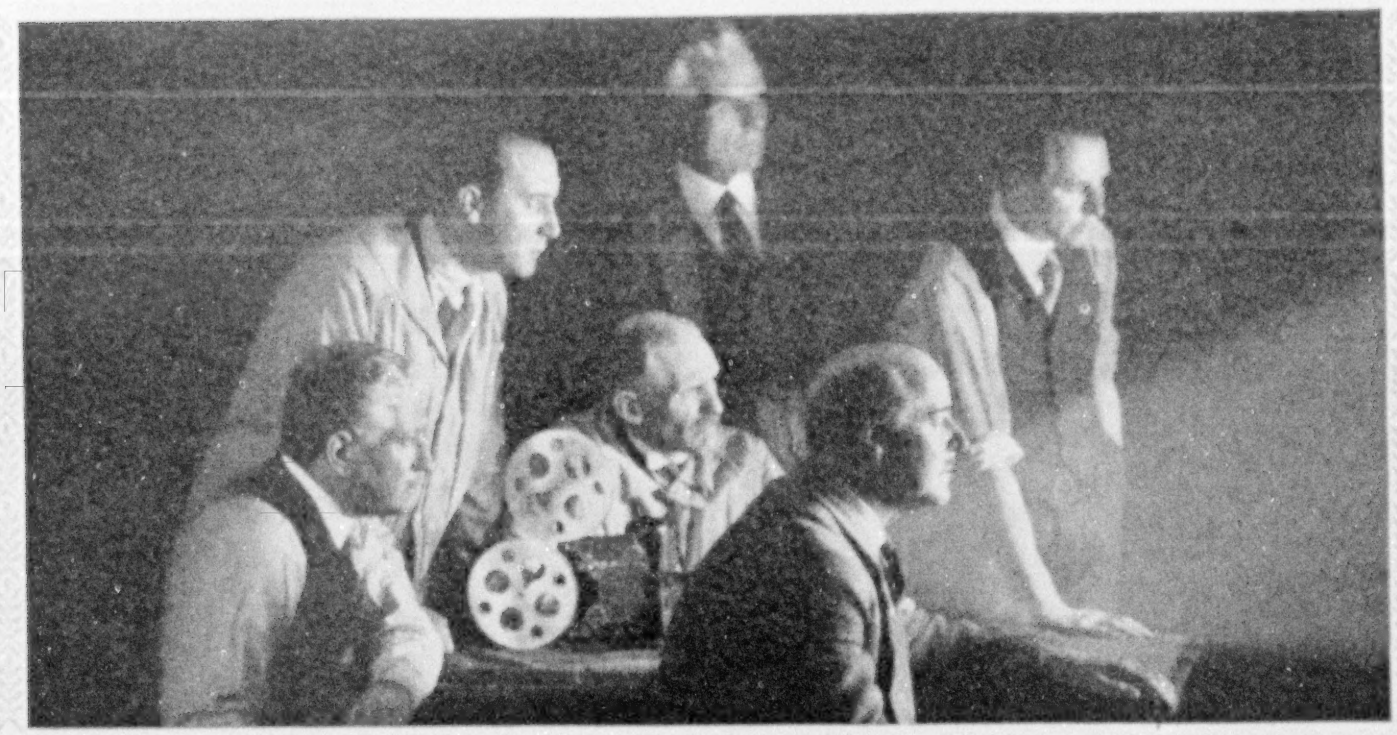

EASTMAN SCIENTISTS FOUND THE WAY

to make Home Movies practical, economical and easy to produce

AGAIN science adds a new joy to the art of living by an amazing discovery. A discovery that is destined to bring a wonderful new entertainment thrill to millions of people.

You've seen professional movies, of course. Hundreds of times. Now science has taken another great step and brought amateur movies right into your home.

Real movies . . . of people you know. Children you love. Places you go. Movies that you've made yourself are now easy to show right in your own home on your own silver screen.

A difficult problem

Eight years ago Eastman Scientists marked this goal and set out to attain it. They sought to make Home Movies practical, economical, easy to produce. Their object was to eliminate the mysteries of grinding cranks, long-legged tripods and complicated shutters . . . so that everyone could make movies with professional results.

What happened during those eight long years of research matters little.

For these engineers *did* find a way to simplify the making of movies. Into an easy-to-carry camera weighing only 5 lbs. they concentrated every vital necessity of movie production. What a triumph in simplicity! No need to focus. No tripod. No grinding crank. Just sight the camera, either from waist height or eye level.

Then press the button—it's as easy as making a "snap-shot." A shutter whirls inside, and the film slides swiftly behind the ever-focused lens.

Instantly every action within the scene before you, every changing sequence of light and shadow, is registered for all time on your film.

"You press the button— we do the rest"

After the film is taken, *your* work is done. No troublesome developing. No bother or fuss. We finish your films at no extra cost, and return them to you ready to run on your own silver screen.

Then with equal ease your films are shown. Switch on your Kodascope Projector and instantly the screen becomes alive with action. Drama . . . adventure . . . romance . . . all are captured on the film and flash into a swift pattern of light and shadow in the quiet of your darkened room. Home Movies! It is as simple as that.

Ciné-Kodak embodies Eastman's forty years' experience in devising easy picture-making methods for the amateur. Unbiased by the precedents and prejudices of professional cinema camera design, the men who made "still" photography so easy have now made home movie-making equally simple for you.

To supplement your movie program, Kodak Cinegraphs, 100-foot reels covering a variety of subjects, are available at your dealer's. Price $7.50 per reel. You may also rent full length films of famous stars from the nearest Kodascope library.

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Please send me, FREE and without obligation, the booklet telling me how I can easily make my own movies.

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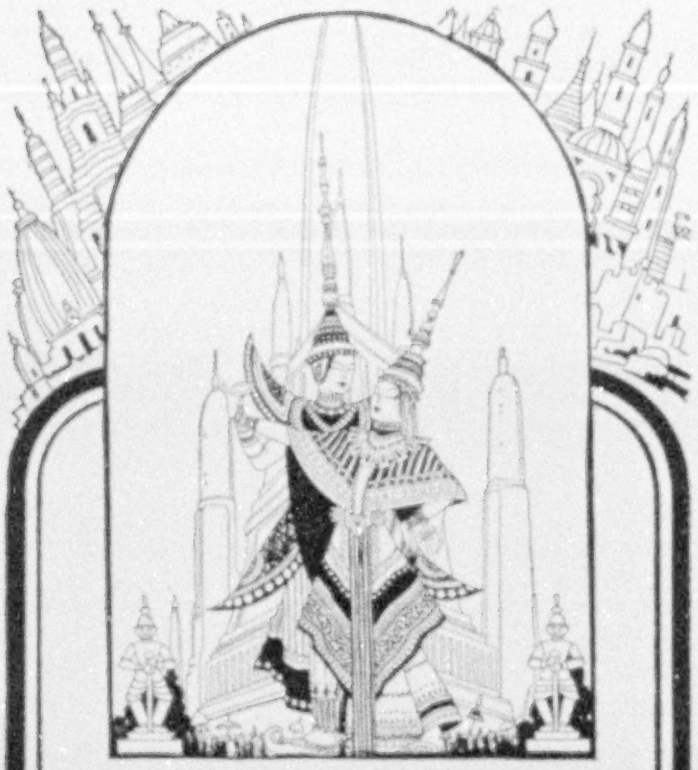

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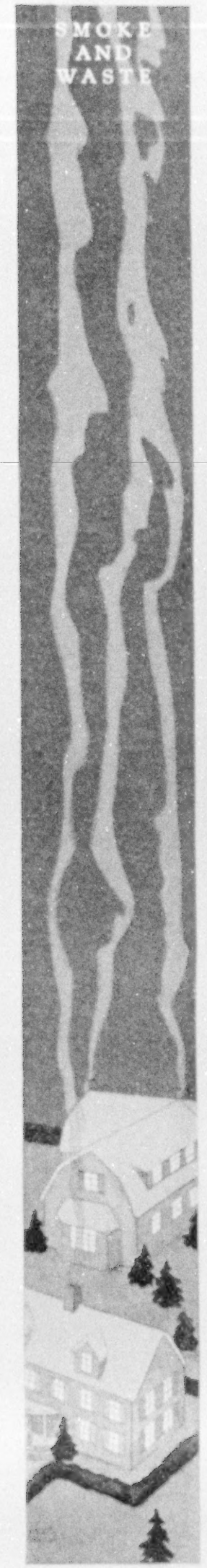

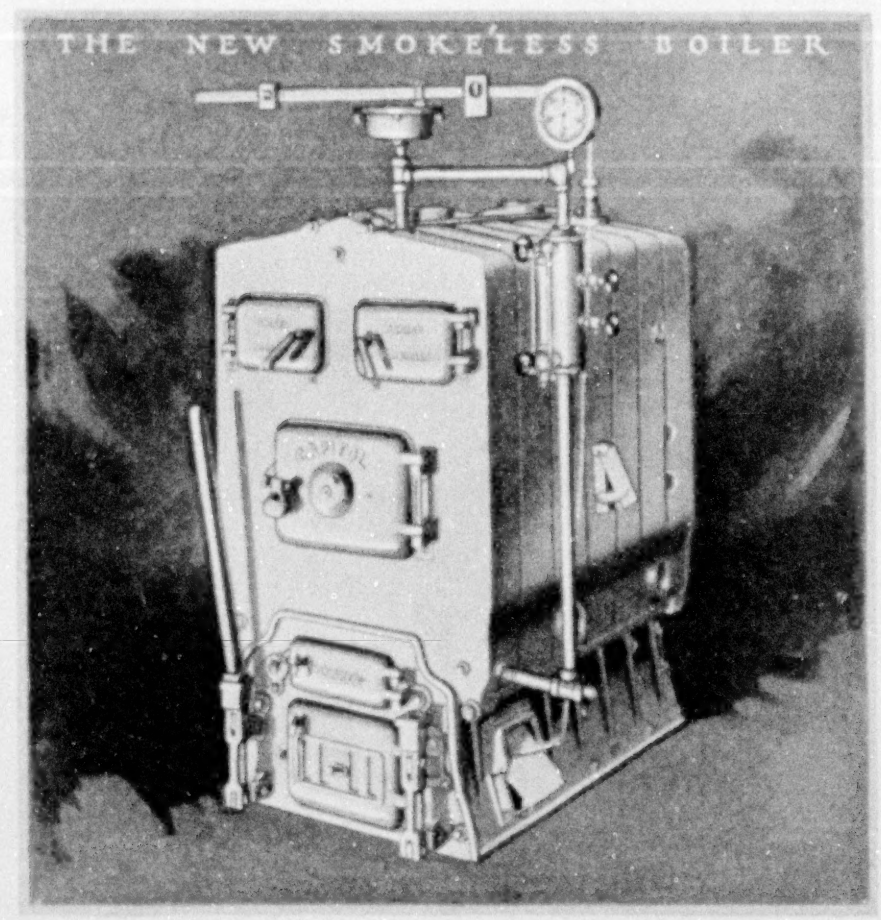

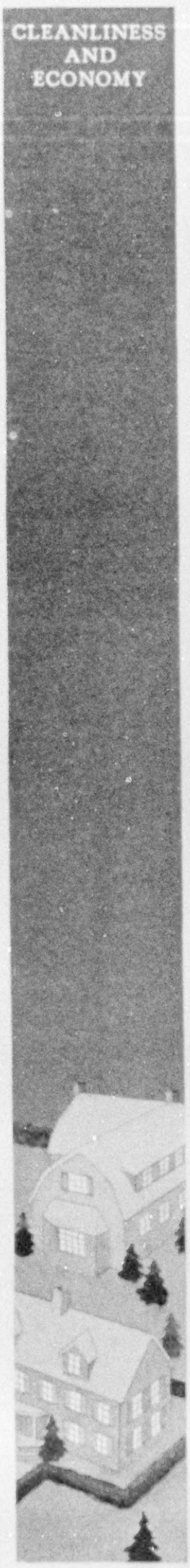

New residence boiler

burns soft coal without smoking

Never again need you scan with sinking heart the rising quotations on anthracite coal. For the new Capitol 20-inch series smokeless boilers burn soft coal with all of its economies and none of its nuisance.

To residences and small homes this boiler offers the same efficient performance, the same money saving, the same clean chimneys that have helped industry comply with legal measures to abate smoke and its evils.

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Write us today for your 7 FREE cool shaves. Your skin will thank you. Or to save yourself time—ask your nearest druggist for 120 of these cool INGRAM shaves. The jar costs only fifty cents.

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COOLS *and* SOOTHES *as you shave*

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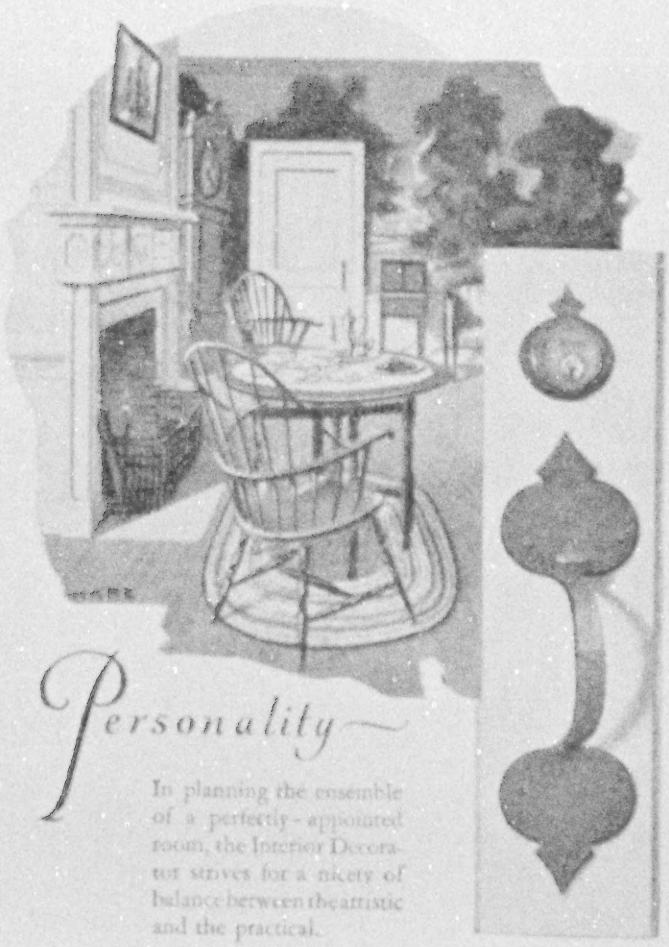

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In planning the ensemble of a perfectly-appointed room, the Interior Decorator strives for a nicety of balance between the artistic and the practical.

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Russwin-ized rooms are always distinctive. Because of its beauty and variety of design, Russwin Hardware lends itself appropriately to the motif of any decorative plan.

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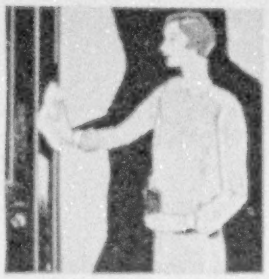

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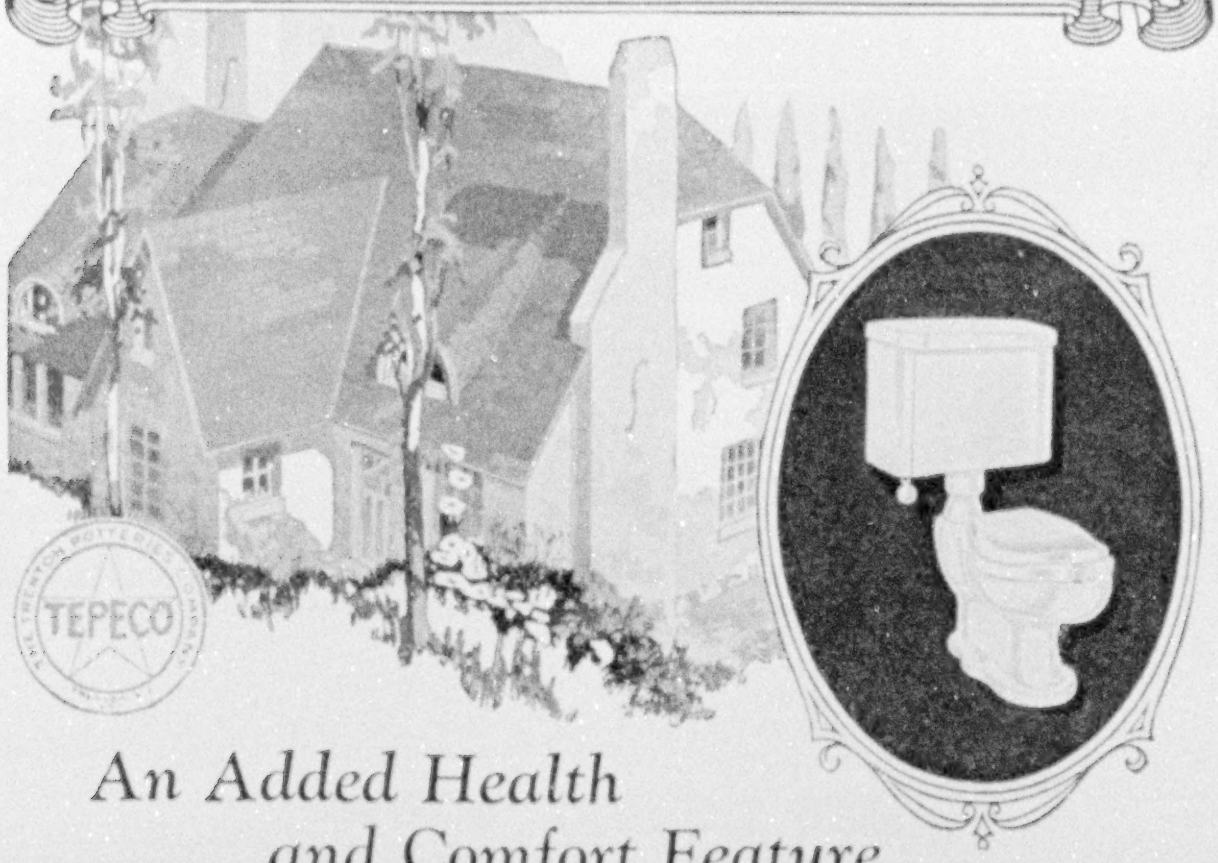

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TO the quiet operation and grace of outline which have made the Quiet Si-wel-clo the choice in homes of refinement there has been added a third feature of the utmost importance.

The improved Si-wel-clo is unquestionably the greatest advance in water-closet construction of recent years. It is the most comfortable, hygienic, sanitary and quiet closet that has ever been devised. The decided dip in the rim elevates the front and rear of the bowl opening, minimizing the possibility of soiling.

Besides the Si-wel-clo, your plumber can show you a wide assortment of closets, tubs, washstands, etc., from the most expensive to the least, yet each an example of the beauty, durability and high sanitary standards which characterize the Te-pe-co line.

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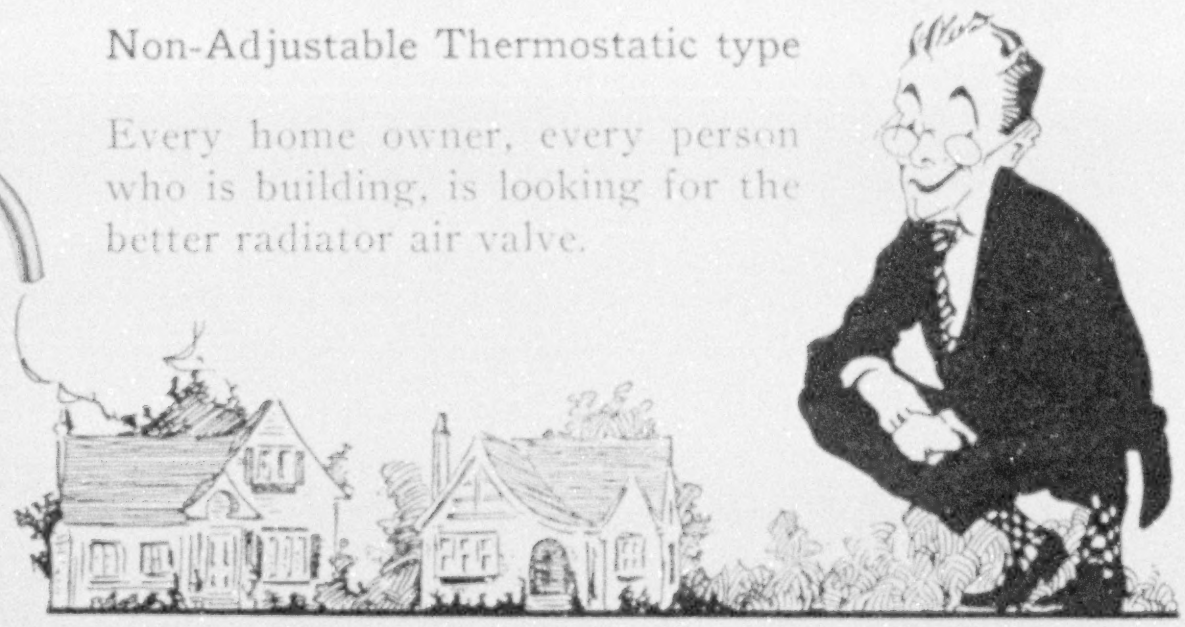

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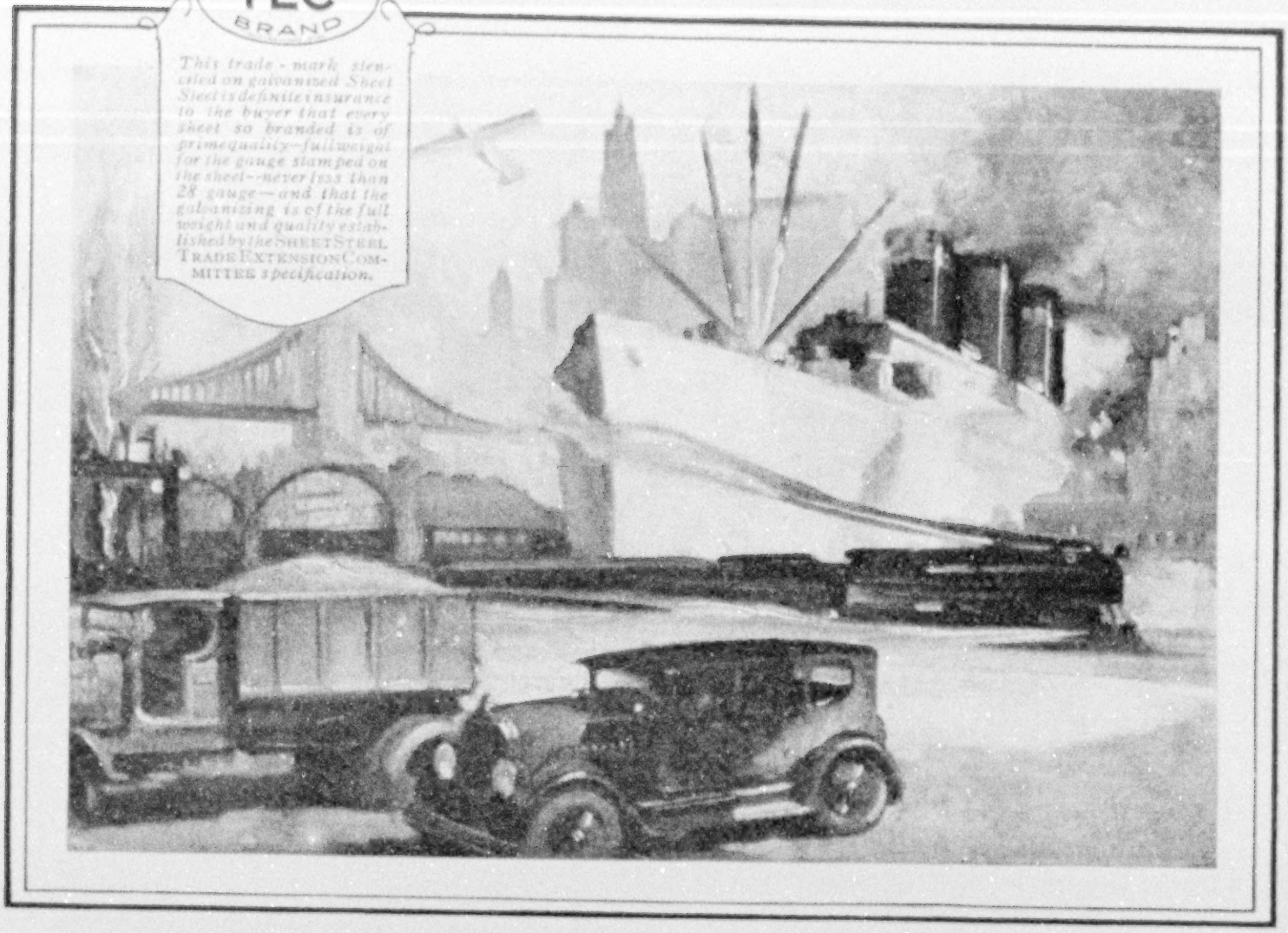
9-27



IT'S STEEL

As the Limited plunges through the night to meet or be overtaken by the dawn, your sleep is no longer disturbed by that nightmare "catastrophe." Gone the nights of tossing about in a half-conscious state, dreaming of wrecks, with the fancied crunching of wooden coaches in your ears followed by the moaning of fellow passengers, wounded, imprisoned, and dying. Today you travel in the all-steel pullman.

When you bundle the family into the new closed car for a Sunday excursion to the country, its all-steel body contributes most to that new feeling of greater security. Being forced into the ditch and overturned no longer has the fatal results that invariably accompanied such accidents only a few years ago.

When a storm at sea hurls hundreds of tons of water against the ocean liner with the passing of each succeeding wave, you read in your stateroom or join a foursome at bridge in the lounge with a matter-of-factness in sharp contrast to the raging of the elements outside. It is steel, not in the framework alone, but in partitions, doors, and trimming, that laughs at the storm and gives you assurance. Today the really modern vessel, like the modern skyscraper, has its interior as well as exterior of steel. A fire at sea has lost its terror.

With a fire loss in 1926 of $560,548,624 America is turning to steel in the home. Beautiful steel roofs have been developed as city building codes are revised to restrict the use of inflammable materials. Steel lath is making it easier to "keep the home fires burning" without burning the home

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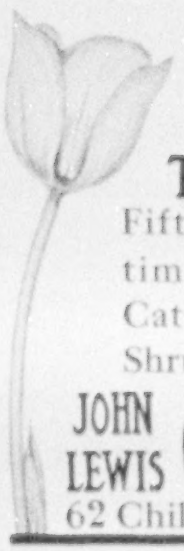

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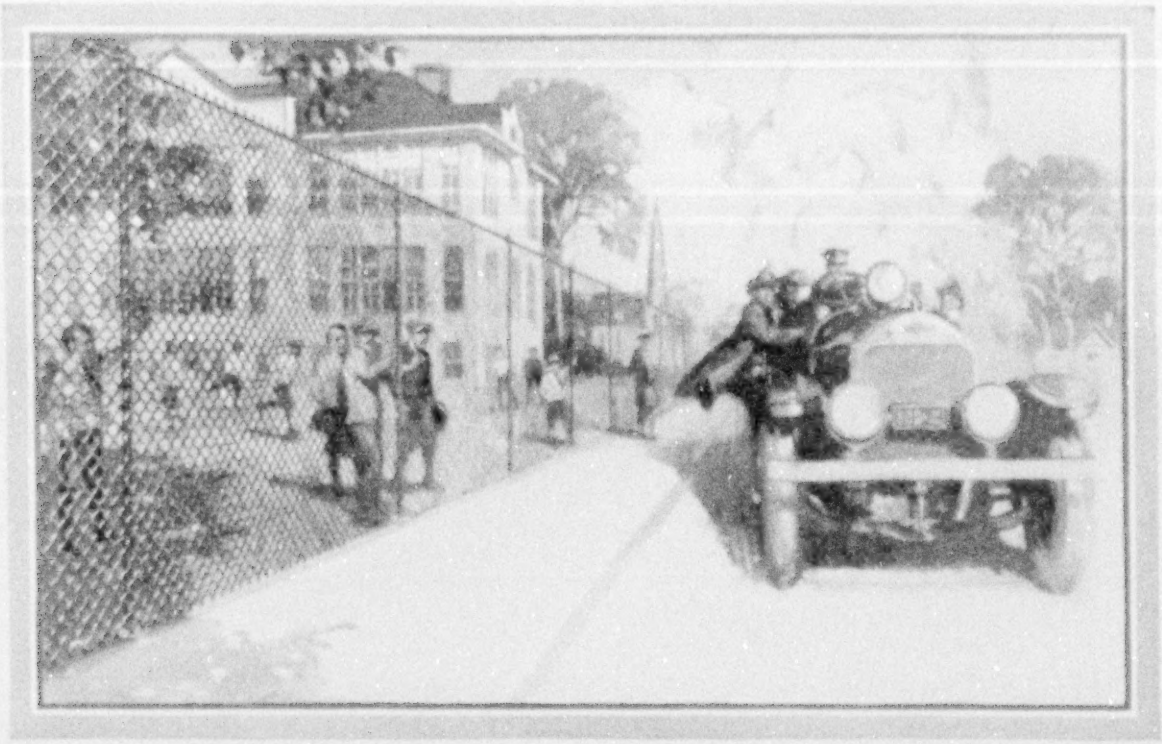

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The Mark of Dependable Property Protection

The siren shrieks, the fire truck thunders by. Danger threatens — but even greater danger lies in the path of regular traffic. Speeding cars, reckless drivers often approach without warning. A child dashes out of the unfenced school ground into the street—another accident!

But school boards have the power to prevent these traffic accidents — to make schoolgrounds safe. Hundreds of school boards throughout America have set the example by enclosing the schools under their jurisdiction with Cyclone Fence.

If you are a parent, consult your school authorities—propose that the school your child attends be fence-enclosed to protect children from constantly increasing traffic dangers. Parents share with school authorities the responsibility of making education safe.

To school authorities: Cyclone Chain Link Fence is the recognized standard for enclosing school grounds. *We erect fence anywhere.*

Write nearest offices for full information, including list of schools that have installed Cyclone Fence.

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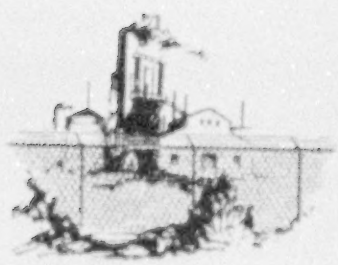
Cyclone Invincible Fence; Chain Link fabric, tubular steel posts and framework.



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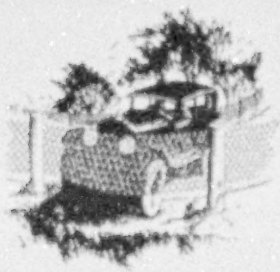

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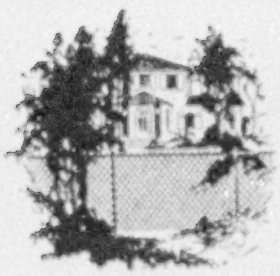

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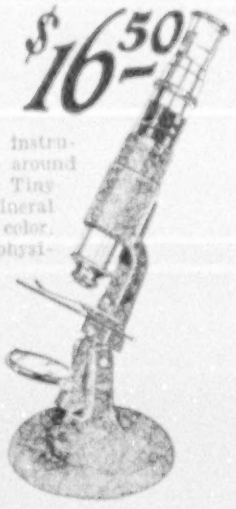

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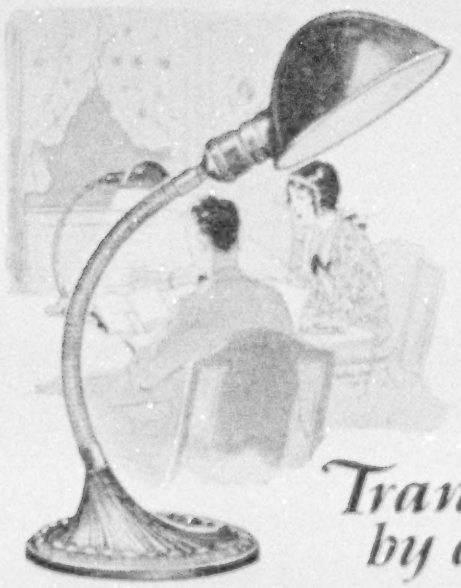

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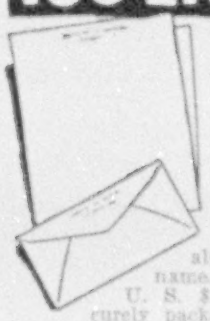

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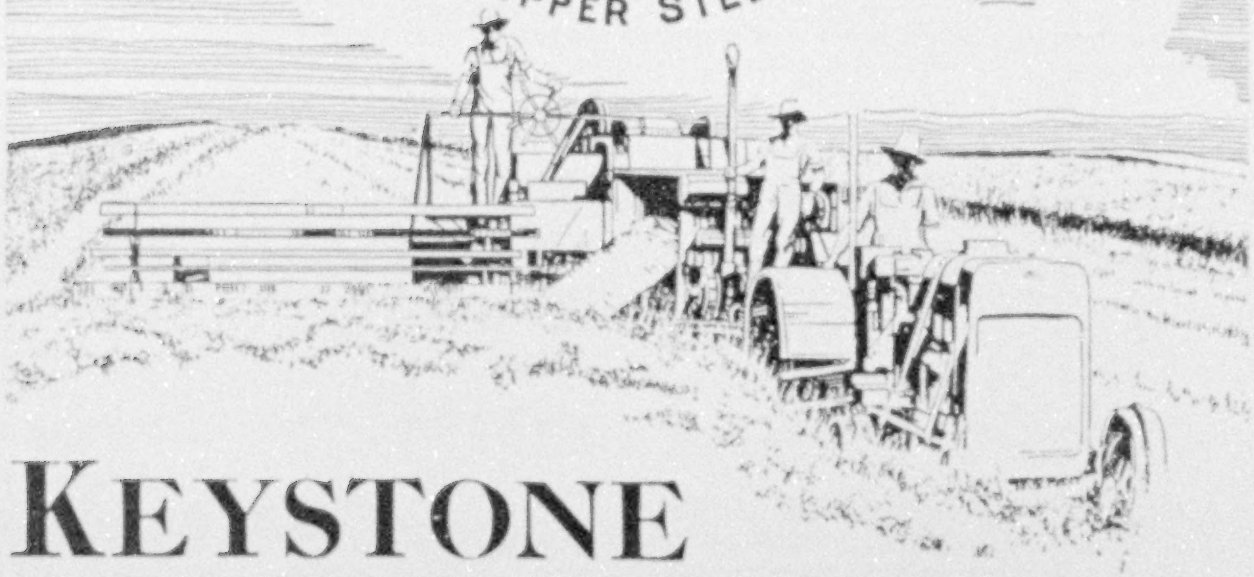

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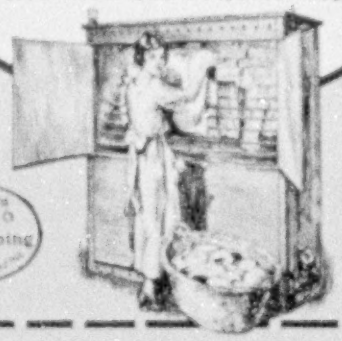

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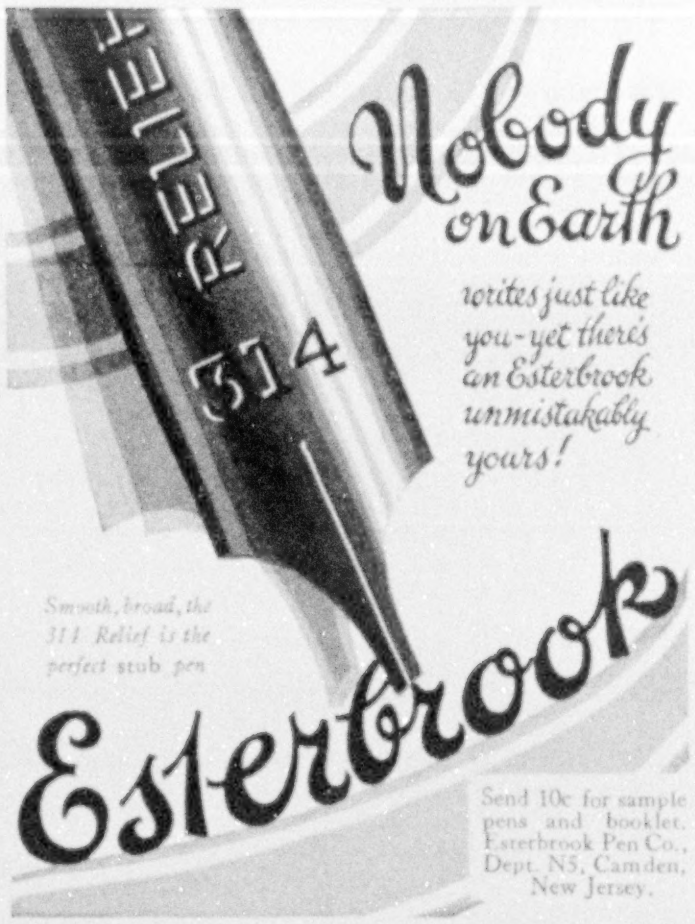

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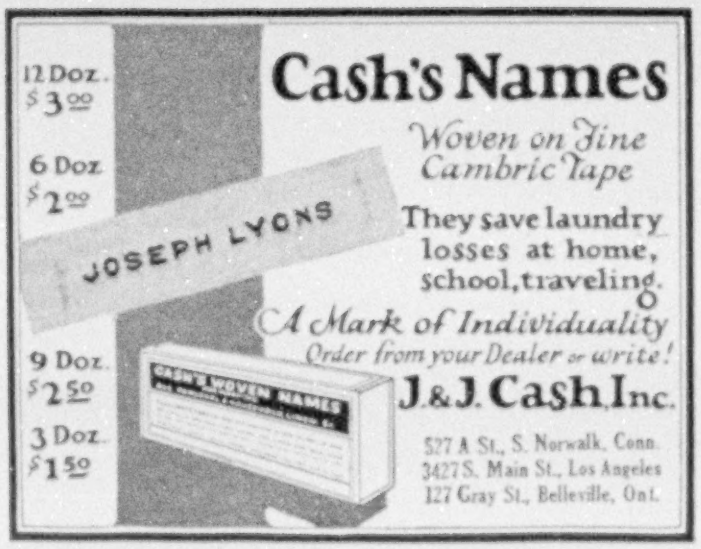

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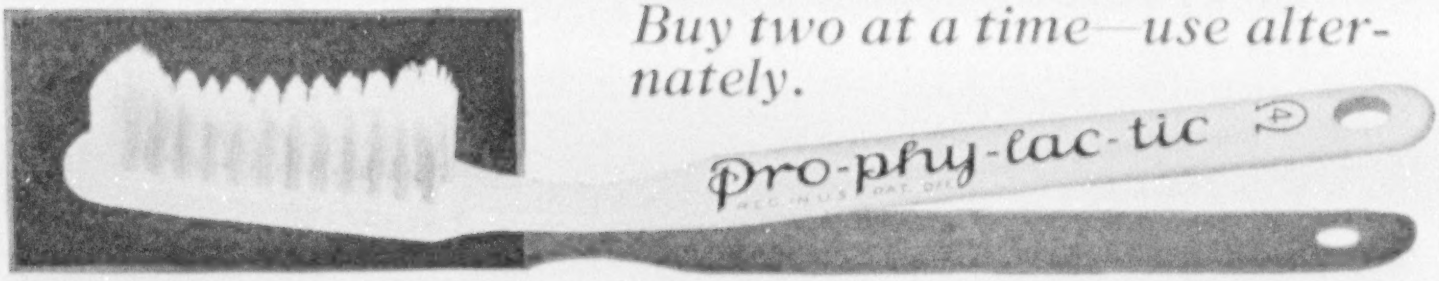

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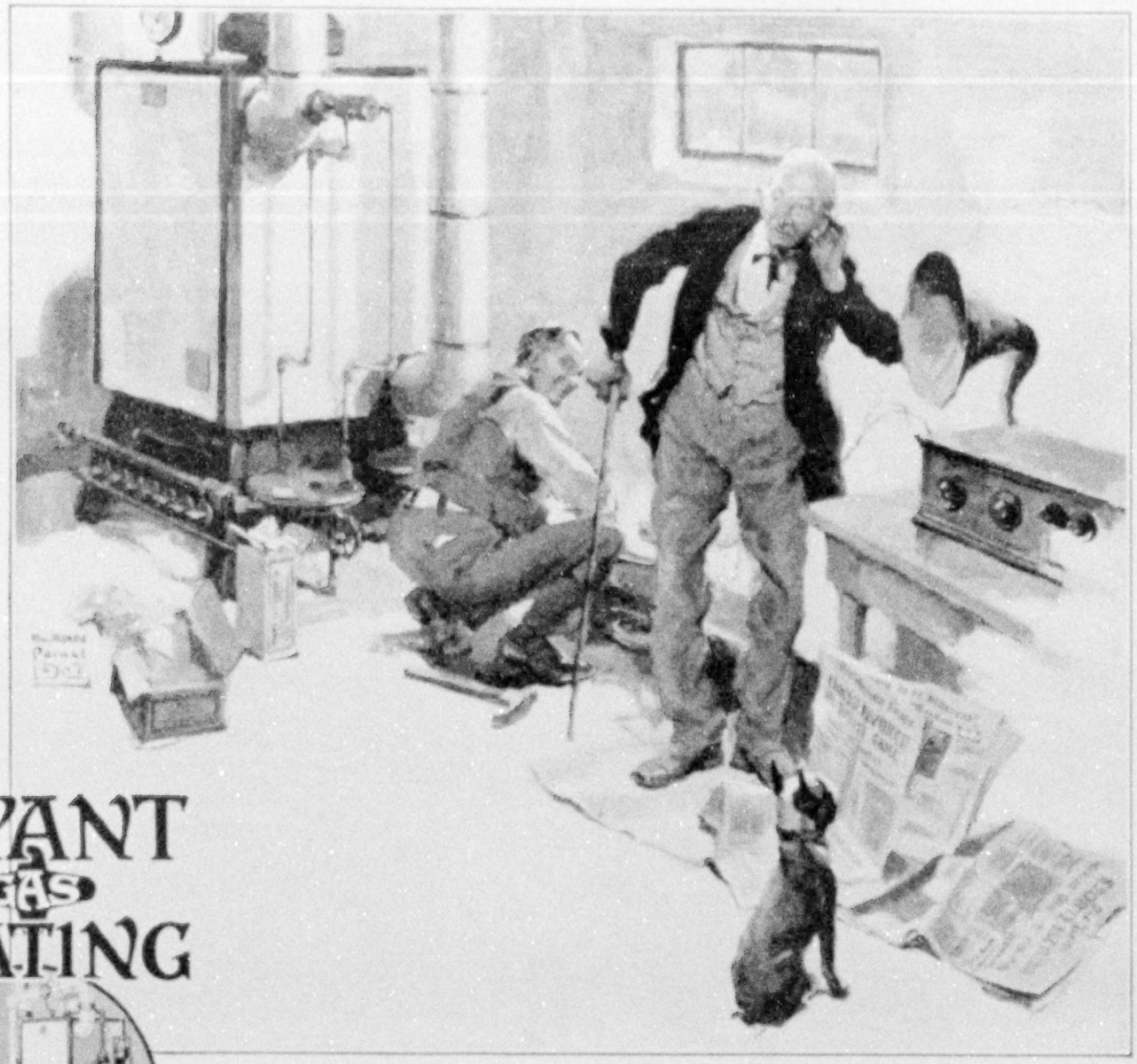
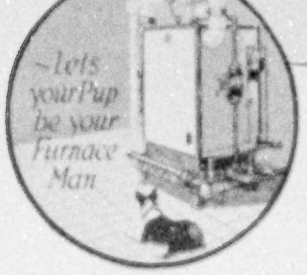


BRYANT GAS HEATING



The Pup is furnace man—Bryant Gas Heating needs no more care or attention than a pup can give it.

How Much Does Gas Heating Cost?

THE high cost of gas heating is often a myth!

If you compare the annual dollar and cents cost of Bryant Gas Heating with the costs of coal or oil—considering fuel cost, labor of furnace tending and handling ashes for coal; and including the cost of gas pilot lights, electricity and depreciation of burner equipment for oil—gas heating is generally not a great deal more expensive. Many gas companies have granted special low rates for house heating, and where such rates are effective the cost of this carefree luxury is rarely beyond the reach of most home owners. In some cases the actual dollars and cents cost of gas will be below the all-over cost of either coal or oil heating.

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Of course the gas rate and type of gas furnished by your local gas company, the construction of your house, and coldness of the winter in your community all have a bearing on the cost of Bryant Gas Heating. Just what this cost will be for your home can be closely estimated by a good gas heating engineer.

Any of the 32 Bryant offices will gladly have an accurate estimate prepared—without charge, of course. Call your local Bryant office, if one is listed in your 'phone book, or write to us at Cleveland. If, in the meantime, you would like more complete details of this carefree heating service, write for a copy of the booklet, "Let the Pup be your Furnace Man."

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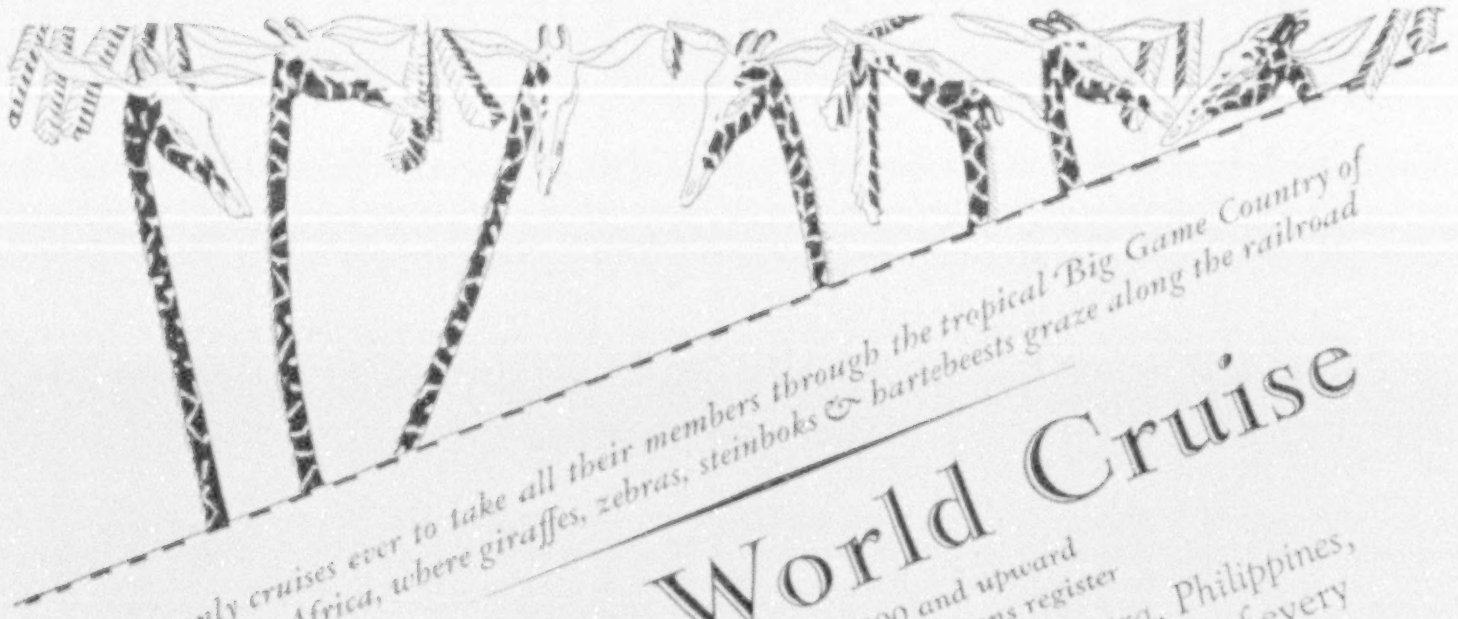

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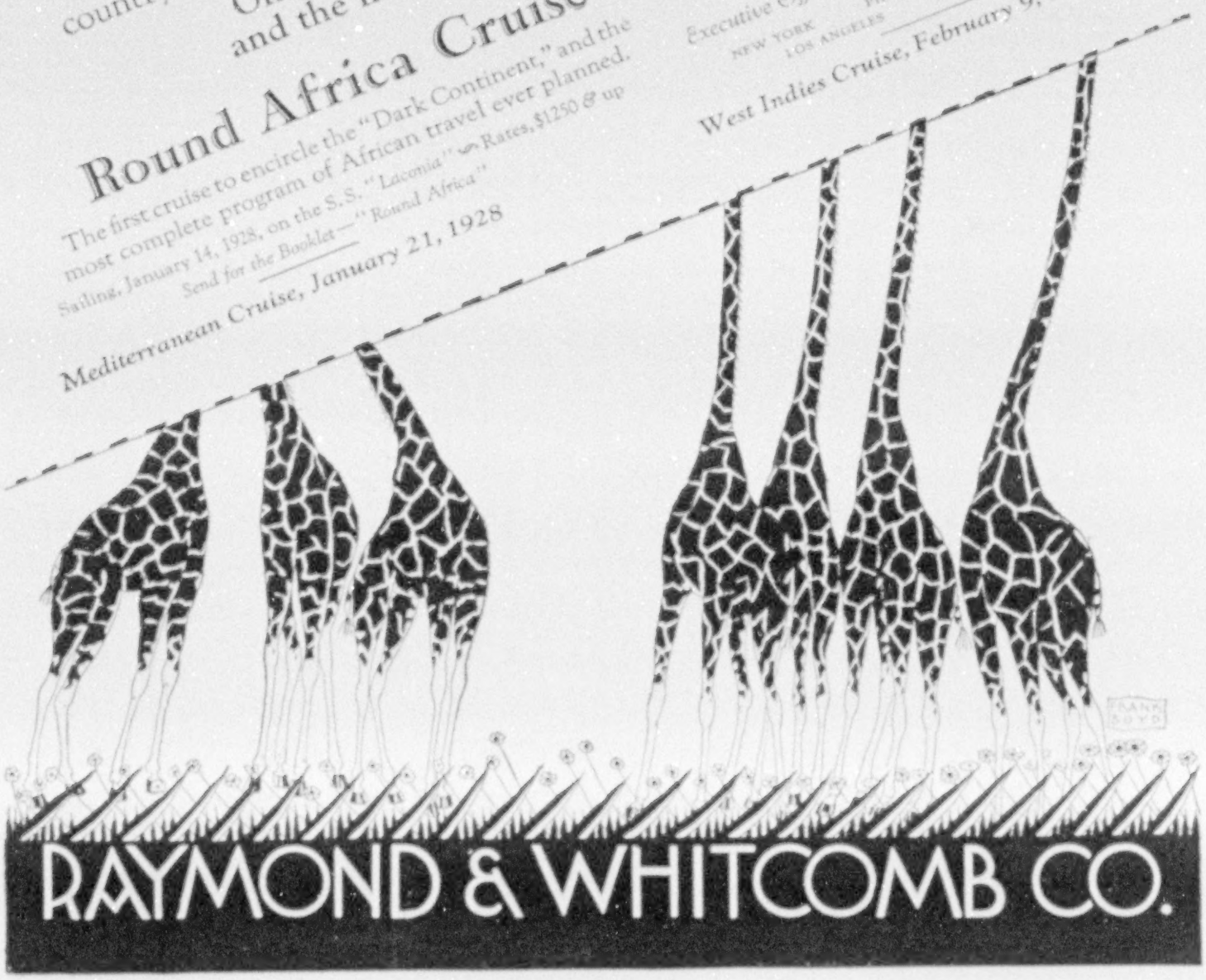

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Hoover leadership makes plain that the easier, faster, deeper cleaning which "Positive Agitation" means, is an advantage that American women not only appreciate but have the intelligence to demand!

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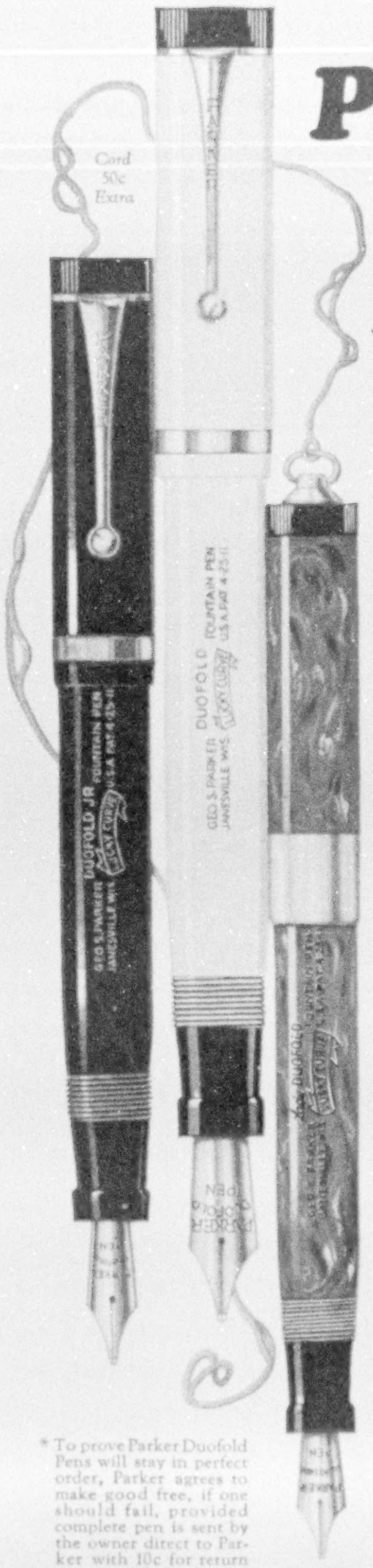

Announcing
Pressureless Touch

In a Pen that Ends Breakage—Brings Jewel-like Beauty—28% Lighter Weight

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We discovered a way to make them write without pressure—by using capillary attraction combined with gravity flow. This requires a special ink channel, hand-ground between the prongs of the point.

It increases our cost but we haven't increased our price.

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